ishing Ports
nd Markets

Edited by

STAFF MEMBERS of the Fisheries Economics and Institutions Division and Fishery Industries Division, Department of Fisheries, FAO.

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PORTS AND MARKETS IN MANY COUNTRIES

In preparation for the Conference held at Bremen, FAO invited countries interested to submit a paper describing the present fishing ports situation in their countries, embracing particulars of administrative systems applied, marketing practices and selling systems, related services such as quality control and market news as well as details of recent development plans.

A number of papers of varying comprehensiveness were received but it was not possible to reproduce them in full. Accordingly, short summaries were made which give a diversified picture of the different types of fishery and fish harbour sites in various countries.

Limited numbers of these summarised versions in English, French and Spanish are available from FAO on request. Countries concerned are:

- Algeria
- Argentina
- Australia
- Belgium
- Central American Isthmus
  - Costa Rica
  - El Salvador
  - Guatemala
  - Honduras
  - Nicaragua
  - Panama
- Chile
- Colombia
- Congo (Brazzaville)
- Cyprus
- Denmark
- Finland
- Gabon
- India
- Israel
- Italy
- Jamaica
- Japan
- Madagascar
- Mexico
- Netherlands
- New Zealand
- Philippines
- Poland
- Sweden
- Tanzania
- Thailand
- Tunisia
- United Kingdom
- United States of America
- Zambia

Requests should be made to Fishery Education & Services Branch of the Fishery Economics and Institutions Division, FAO, Rome.

Preface

IN recent years, the Department of Fisheries of FAO has received many requests from governments for information and advice on the problems of harbour development. It is clear that further development of many of the world's fisheries is dependent upon the provision of better harbours and landing facilities, capable of sustaining larger and more efficient vessels, and providing a firm basis for the necessary improvements in the marketing and distribution network.

Although FAO has provided experts and advisory services in this field, the Conference on Fishing Ports and Port Markets, held in Bremen in 1968, was the first of its kind. Our purpose in organizing the Conference was to provide a forum where representatives of all the many different disciplines involved in the development of harbours and shore facilities could discuss their mutual problems. The problems of harbour development are many-sided, involving not only narrower considerations of engineering and economic viability, but also often closely related to the social and political values of the country concerned. For this reason, a concern for harbour development should involve many different disciplines, and the Conference provided an opportunity for many of the participants to see the nature of the tasks facing their colleagues in other fields. In particular, it reflected the different approaches of those working in the physical sciences and those concerned with the economic, social and administrative aspects of harbour and port development. I am sure this opportunity for the confrontation of different viewpoints contributed greatly to the success of the Conference.

In this volume we are pleased to make available to a wider audience the papers that were prepared for the Conference. Whilst the treatment cannot be considered exhaustive on all the aspects of harbour problems, it provides an excellent survey of the main areas of concern and clearly illustrates that the solution of these problems requires the contributions of a number of disciplines.

The discussions during the Conference were full and frank. It has been impossible to reproduce them in their entirety, but we have sought to reflect the many different points of view and professional attitudes that were evident in the discussions. For this reason, we consider the present volume to be of value to all involved in the problems of harbour and port installations, be they administrators, planners, engineers or those involved in fishing operations.

The main lessons of the Conference may be summed up under three headings:

(1) **The multi-disciplinary nature of harbour development and the consequent need for co-ordinated planning and a team approach.**

(2) **The need for realistic foresight and long-term planning, in view of the gestation period of most harbour developments and the pace of change in fishing technology.**

(3) **The essential role to be played by national and international governmental agencies in providing financing for harbour development, due to the high capital costs, the inadequacy of private financial sources and the essentially public nature of harbour facilities.**

In addition to supplying expert assistance and advice through its field programmes, a continuing aspect of FAO's rôle must be to foster the exchange of information about advances in the techniques of fishing port development, and to promote the best standards of planning, design and construction. We believe that the publication of this book will contribute to this process.

On behalf of FAO I should like to express my appreciation to the Government of the Federal Republic of Germany and the Free Hanseatic City of Bremen, as well as to all those who contributed to the success of the Conference.

ROY I. JACKSON,
Assistant Director-General (Fisheries)

Food and Agriculture Organization,
Rome.
January 1970.

Chairman's Introduction

SPECIAL thanks are due to FAO for having met a long-standing need to hold an international conference on Fishing Ports and Port Markets in Bremen in 1968. The Federal Republic of Germany therefore gladly acted as host country for this Conference and, together with the Free Hanseatic City of Bremen, participated in its preparation and organization.

The large number of participants from all parts of the world gave evidence of the world-wide response which this Conference attracted. It was learnt from the many contributions that the installation and the maintenance of fishing ports and markets are very complex operations which, moreover, require a great divergence of approach according to the regional conditions, and in particular between the economically developed and the developing countries.

The rapid expansion of sea fishing during the last few decades has resulted in continuous structural changes in the fishing and marketing sectors, especially in the technical field. The modern fishing fleets depend to an increasing extent on well-equipped fishing ports and port markets where new model concepts have had to be developed to ensure that the employment of fishing vessels, the transshipment of the catch, the processing and marketing run as smoothly and as rationally as possible. To achieve this it is above all necessary that a close co-operation exists between the fishing specialists, the ship-builders and the civil engineers. This was reflected at the Conference in Bremen not only by the composition of the participants but also by the presentation of so many excellent papers. Moreover, the unique opportunity given us at this Conference to examine all the important problems involved from many different aspects contributed largely to the success of the Conference.

Fishing ports and port markets do not only require high capital investment but also considerable maintenance costs. Therefore it is very important that at all stages of the development preparation real team-work be maintained among the planners.

According to the experience gained in the past, suitably designed and well-functioning fishing ports are the main prerequisite for the improvement and development of a country's fishery as a whole. In the past these factors have often been neglected by both the governments and the fishing industries. Apart from the whole infrastructure of the national economy which plays a certain part in the planning of ports and markets, the structure of the fishing industry itself has a great influence in determining whether regional concentration in port and market development should be pursued. Where deep-sea fishing prevails so too does the trend towards regional concentration whereas, regarding the near-water fishery, the need for a larger number of smaller ports and markets must predominate, and to avoid conflict great care must be taken in site selection.

All these questions were discussed in detail at the Conference in Bremen, and the present publication of the proceedings of this Conference is a valuable source of information for all those who in the future will have to deal with the planning, installation, rebuilding and organization of fishery ports and port markets. But any schematism should be avoided, because one simply cannot copy existing facilities but must take into account all relevant factors and always find new solutions in order to achieve optimum results.

Bonn, May 1970.

DR. GERHARD MESECK, *Ministerialdirigent im Bundesministerium für Ernährung, Landwirtschaft und Forsten der Bundesrepublik Deutschland.*

SESSION I

Final Selection of Sites for Fishery Harbours

by S. Ó. Meallain

Choix final du site d'un port de pêche

L'auteur range les ports de pêche ou centres de débarquement en trois grandes catégories, selon leur importance: considérable, moyenne et secondaire, en proposant pour chacune d'elles une définition provisoire. Il énumère dix conditions essentielles auxquelles doit répondre un site convenant à l'établissement d'un grand port de pêche, en s'attachant plus en détail à certaines d'entre elles. Diverses études techniques doivent être effectuées, notamment mesure de la marée, de la houle et des vents, transports littoraux, exploration du sous-sol, et évaluation des ressources en eau. Dans certains cas, il faut recourir à des essais sur modèles réduits. L'auteur propose une classification des ports ou centres de pêche intermédiaires et secondaires en cinq catégories. Il précise que les ingénieurs ont besoin d'informations et de prévisions dignes de confiance sur les paramètres des navires pour pouvoir organiser les travaux d'aménagement, et présente des suggestions touchant la collecte et la diffusion des données en question. Il conclut en soulignant le rôle important de la tradition et de l'élément humain.

L'étude n'envisage pas le cas des navires-usines.

Selección final de sitios para puertos pesqueros

En este documento se consideran tres categorías de puertos: puerto mayor, puerto intermedio y puerto menor ó lugar de desembarque y se sugieren definiciones preliminares para cada una de estas categorías. Examinando algunos de ellos detalladamente, se mencionan diez de los requisitos principales necesarios para erigir un puerto pesquero mayor; incluyendo los estudios previos de ingeniería referentes a mareas, oleaje, vientos, movimientos del material del fondo, naturaleza del sub-suelo y al aprovisionamiento de agua. Se menciona también la necesidad de efectuar, en algunos casos, ensayos en modelo. Se establecen cinco de las categorías en que pueden dividirse los puertos intermedios y puertos menores ó lugares de desembarque. Se tratan la información y pronósticos fidedignos sobre características de los barcos a emplearse, requeridos por los ingenieros para planificar las obras de construcción y se sugieren medidas para colectar y diseminar tal información. Se señalan la importancia de los recursos humanos y de las formas de vida tradicionales.

En este documento no se tratan problemas relacionados con barcos-fábrica.

THE final selection of a site for development as a fishery harbour is essentially a political decision in that factors other than economic must be taken into account. Once made it can hardly, if at all, be reversed. This character of the decision is independent of the magnitude, the economic importance of the harbour or the extent of the works involved. The consequences, however, of a wrong decision will naturally be more far-reaching in the case of a major undertaking, both relatively as well as absolutely. There are, indeed, in various parts of the world examples of harbours, which, because of faulty location or inaccurate forecasting, are no longer used for their original purpose.

For this discussion it is desirable that an effort be made to determine categories of fishery harbours, and to do so on a basis of function rather than of cost, although clearly cost cannot be ignored. Three categories come to mind. Major fishery harbours are ports at which all functions directly and indirectly connected with the fishing industry can be carried out. They are to a large extent self-contained and self-sufficient. Intermediate ports are those where facilities exist for the safe harbourage of fishing vessels of the largest size currently in use, and where vessels can discharge their catches, take on stores and provisions, and where adequate road connections exist for rapid communication with centres of population but where there is no elaborate "infrastructure" such as is essential at a major port. Small ports and landing places are those which cater primarily for local needs. Safe shelter afloat is desirable but not always necessary if vessels can be taken ashore readily.

MAJOR FISHERY HARBOURS

Ideal requirements for harbours

In choosing a site for a major fishery harbour a great many factors must be considered, not all of which can be readily weighed and accurately evaluated; some, indeed, may not be clearly identifiable. Mr. Carl G. Bjuke, the well-known Swedish harbour consultant, set down the following ten requirements:

(a) Convenient distance to fishing grounds.
(b) Good location in regard to existing or planned communications to a potential fish market.
(c) Adequate and suitable space both on the sea side and the land side for development of an efficient fishing station. This should include suitable areas for fish processing and auxiliary industries, boat building and repair, offices and shops, traffic and parking space for lorries and other vehicles, garages, etc.
(d) Attractive residential location for the fishermen and their families and for fish traders and other groups engaged in the fishery and ancillary enterprise.
(e) Safe access from the open sea in all weather and at all stages of the tide.
(f) Safe natural or artificial shelter in the harbour at all times for all the vessels likely to use the harbour.
(g) Reasonable initial cost of obtaining adequate depth of water in the harbour approach and at the quays.

(h) Low cost of maintaining adequate depth of water in the approach and at the quays.

(i) Suitable ground conditions at the site for adequate arrangements of breakwaters, basins, quays and shore facilities, etc., to be constructed in one unit or in stages according to a general plan.

(j) The site should be unrestricted for acquisition of the land required for the fishing port project. Furthermore, this land should be retained for those enterprises only that have a direct bearing on the trade of the port. Otherwise the operation and development of the port could be severely crippled.

Fleet forecasts

Undoubtedly the most significant factor is the number and size of the vessels of the fleet which will use the port. Not all fishing vessels should count. Factory vessels in the real sense should be disregarded: they are, for practical purposes, dry-cargo ships which should be accommodated in ordinary commercial ports. Neither, is it necessary to consider in detail boats of a much smaller size than those of the predominant class. It is sufficient to provide space for the smaller craft; they can fit in with the arrangements for the larger ones. It is important, however, that the engineer responsible for port design has readily available data concerning the boats that are likely to form the bulk of the port fishing activity. He must be provided with good forecasts of the rate of growth of vessels which will be using the port, both as to numbers and sizes. Generally speaking, it is fairly easy to find a site where there are possibilities for expansion so that full development can be planned in stages. This is normal procedure for any port, expenditure on capital works being undertaken only when it becomes necessary to increase port capacity. The importance of drawing up an outline plan covering long-term development is obvious.

Character of the site

There must be a large naturally-sheltered water area, or at least an area where shelter can be provided at relatively little cost. Sea approach should be unobstructed and deep so that passage from open sea to shelter can be made in all weather conditions and at all times. Water in the harbour proper should be deep enough to obviate heavy dredging. The nature of the submarine bottom in the harbour and in its vicinity should be such that siltation is minimal. This last is particularly important. In a paper at a Conference on Technology of the Sea and the Sea-Bed in April 1967, reported in *Civil Engineering and Public Works Review*, March 1968, Messrs. Russell and Lean point out that "maintenance dredging is a penalty for holding a channel below its natural depth". The maintenance of adequate depths of water across bars, in approach channels and in berths is so costly that it is as well to be sure that what is sometimes demanded for fishing vessels is, in fact, necessary. In Ireland two points emerged. The first was the difficulty of ascertaining the drafts of fishing vessels to enable suitable dredged depths to be determined. The second was that where reliable information did become available it transpired that actual drafts were smaller than those quoted when representations were made as to flotation required. Owners and skippers of fishing boats often call for increased draft. John Tyrrell, a very experienced Irish naval architect, referring to vessels 70 ft (21.3 m) long or thereabouts has the following to say "Great draft is not a requirement and indeed excessive draft aft with light draft forward can have an adverse effect". Even when data is forthcoming the technical terms used are confusing to engineers who are, generally speaking, unacquainted with such expressions as moulded draft, moulded depth, registered length, dead weight tonnage and so on, so that they are at a loss for useful data. It would be helpful if lists could be prepared and published giving particulars for a reasonable number of existing vessels of various tonnages, of such details as, draft aft in loaded condition, overall length, length on keel, overall breadth, unladen weight, all of which information is essential for the engineer charged with advising on the selection of a site and with the design of a harbour. FAO might consider the compilation and dissemination of such a list. It need not be exhaustive but the vessels described should be representative. It would also be desirable that they be classified by countries, because there appears to be a certain uniformity of design within any one country. Consideration might also be given to including a glossary for the benefit of laymen of terms commonly used in naval architecture. The word "design" may mean rather different things to the civil engineer and the naval architect.

Planning and acquisition of the land area

Of almost equal importance with water area is suitable shore area to accommodate all the activities associated with a large fishing port. The combination of good sea and land areas both adequate in extent is not often realized.

The authority which provides for fishery harbours is usually either the State itself, or a body set up by the State or by a municipal or similar authority. In all cases the capital cost is likely to be provided in whole or in part by the State. Among the items on which considerable sums may have to be spent is the acquisition of land. Apart from being costly this can involve a very complicated series of transactions, frustrating because of the time consumed in completing them. Furthermore, there is always the risk that when the intention to develop becomes known private buyers are likely to intervene, some as speculators, some merely with the intention of being favourably situated in the new development but to the detriment of the overall plan. At the outset the developing authority should either itself acquire sufficient land adjacent to the harbour or have powers to control development within a wide area. It might even be desirable for the authority to acquire land even at those sites which are merely in the running, disposing of it later should a decision not to develop be taken. What is involved is not merely land prices but the optimum shape of the harbour development. It goes without saying that services such as water, power, sewage disposal arrangements, first-class road connections with main centres are all essential.

Whatever the eventual pattern of the fishing industry when everything is streamlined and automated so that there is a fully integrated activity of unified design, it is important to realize that one of the most valuable shore facilities is open space in the immediate vicinity of the wharves. There will always be pressures to ensure, for processing establishments, direct access to adjoining wharves so that full production line techniques from ship to consumer can be used, or to persuade that manufacturing activities such as winch or engine manufacture or net making should be similarly located. It is seldom, if ever, that these so-called ideal conditions can be satisfied. Not every freezing plant can be accommodated alongside berthing space. A scheme of priorities should be drawn up and worked into the master plan to ensure the most economical use of space developed, probably, at high cost, and of which there is never likely to be an excess. The point here is that a site which is otherwise suitable and which can be developed economically should not be rejected merely because it would not be possible to locate within the area and adjacent to quays all the activities that one would like to accommodate there.

Physical Investigations

The number of sites for which there are competing claims can usually be reduced to a few, between which, however, a final choice may not be easy. When that stage has been reached steps should at once be taken to initiate observations of tidal phenomena, wave heights, wind force and directions, currents in the sea, movement of beach material at or near the sites where these observations appear to be necessary. They should be continued at the site eventually selected even after the harbour has gone into service.

Subsoil investigation is essential. Experience has shown in some cases that even when a reasonably close series of bore holes has been made, the subsoil condition found during actual dredging or construction operations may diverge rather widely from those derived from the investigation. There is always the possibility of marked discontinuities in the ground between bore holes where these are spaced at reasonable intervals. A very close network could prove too costly in relation to the overall cost, but some form of echo survey along the lines of the holes might prove useful.

In some cases model tests may be advisable; such tests are usually confined to the site finally chosen to determine the best means of ensuring maximum shelter, minimum siltation and so on.

It may also be essential to measure stream flows from which potable water can be obtained should existing supply be fully extended.

A factor not to be overlooked or discounted is tradition. A deliberate attempt to establish a fishery harbour where no tradition of fishing exists is likely to end in failure. There have, of course, been cases where whole fishing communities have been transferred or have migrated from one location to another, generally under pressure of events but they are uncommon. It is almost axiomatic that while the existence at any particular place of a strong fishing tradition offers no guarantee of worthwhile growth, the absence of it would mean failure. It is well to realize that success of a projected development depends largely on men and not solely on economics. In the long run the human factor is likely to prove the sounder basis, even from the economic point of view.

INTERMEDIATE AND SMALL FISHERY HARBOURS AND LANDING PLACES

The effect of changes in vessel design

It is sometimes thought that development of a few major fishery harbours will eventually make smaller ports redundant. Such thoughts are erroneous. Undoubtedly there is some movement to big ports and occasionally small ones fall out of use, but on the whole the vacuum left by departing fishermen is filled by newcomers, provided there is no great change in population density. It is often not appreciated by the non-expert that fishing ports which were very satisfactory in the days of sail may be quite unsuitable for motor vessels. One great effect of the change over to motor craft, even of quite small tonnages is an enormous increase in the cost of the craft and the consequent importance of protecting them. The general demand for ever-increasing horsepower continues to push the cost of fishing vessels up. The fact that such boats are usually equipped with echo sounders or other instruments requiring attachments near the keel may make it undesirable that they should take the ground in the fashion of vessels before the advent of such aids to navigation. There is also the more important consideration that by taking the ground where this cannot be avoided strains induced in the hull may affect engine and stern shaft alignment unless the grounding is carefully controlled. The result is that ports suitable for the accommodation of present-day craft, however small, must offer much more elaborate and carefully planned facilities than those of 50 years ago. It is obvious too that the cost of such facilities is likely to be comparatively high.

A small example may illustrate the point. Along several stretches of the coast of Ireland in rather remote areas, where there is exposure to the Atlantic Ocean and where the shore configuration is such that sheltered harbours where boats could be kept afloat are hardly practicable, fishing has been carried out in craft, usually curraghs (canvas covered, oar propelled craft) from time immemorial. Curraghs were, and in many places still are, used because, being light, they can be got out of the water to safety with comparative ease. The fishing in many cases is for lobsters or crawfish and provided a crew can handle enough pots, this can be a lucrative part-time occupation. Twenty-five years ago it became the custom to fit these curraghs with outboard engines so that a crew of two could handle more pots than could a crew of three formerly. It was still fairly easy to get the light hull ashore, although the engine made that operation rather more difficult.

In recent years curraghs are being replaced by small 26 ft (8 m) yawls specially designed for the areas in question and fitted with 7–8 hp inboard air-cooled diesel engines. More recently still, rather larger boats—32 ft (10 m) in length—appropriately powered, have started to come into use in some of those areas. These craft

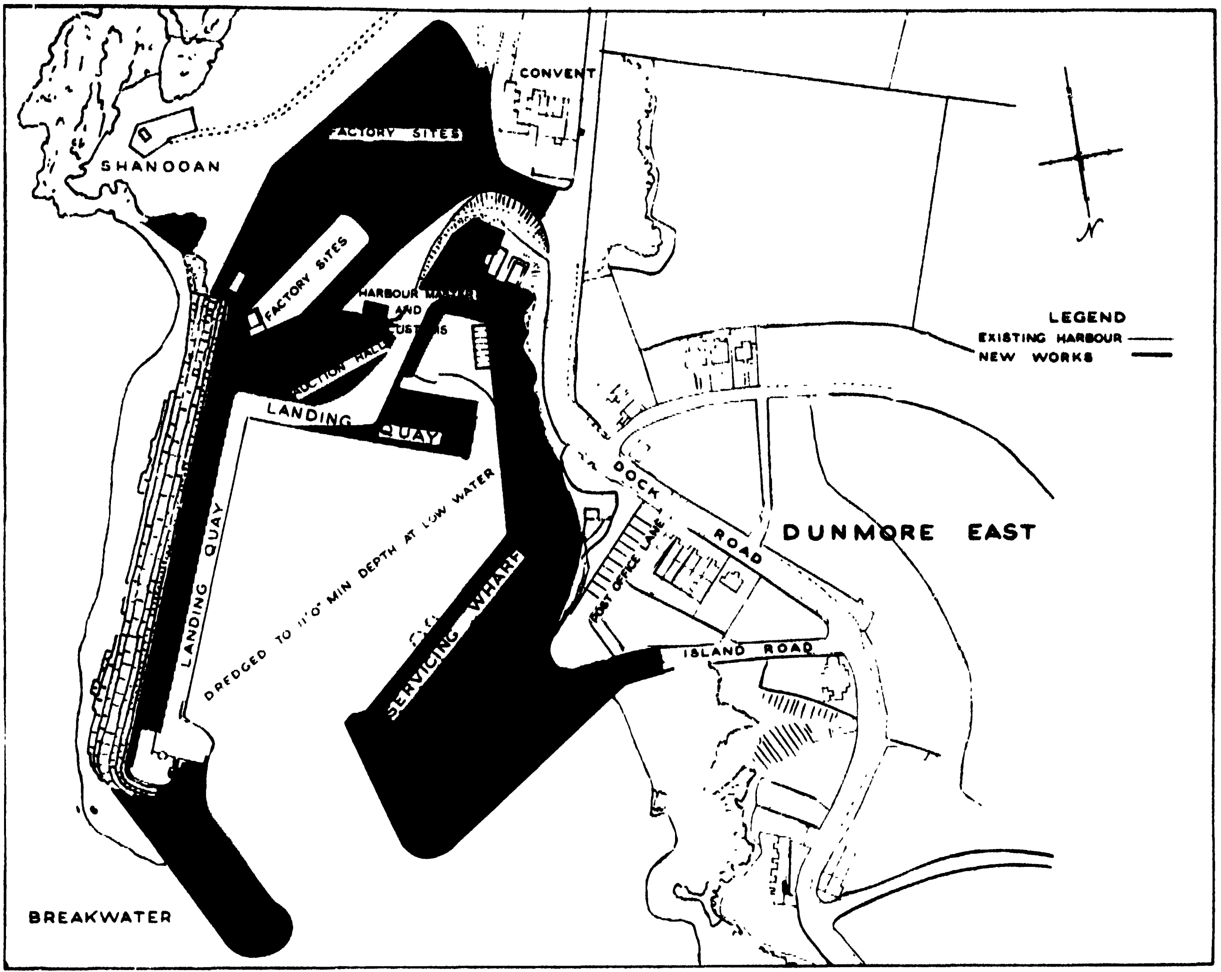

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Fig 1. Dunmore East harbour. Plan showing proposed development.

(26 to 32 ft (8 m to 10 m)) permit the fishermen to make much improved earnings, but they demand much more advanced port facilities either by way of safe floatation—which is not often practicable—or, by means of getting the boats to safety ashore, weighing as they do upwards of one ton. The result has been, of course, that decisions have had to be made as to which of many competing landing places should be selected for development as centres for such craft.

Classification of smaller ports

Two years ago a survey was begun of fishing ports and landing places along several stretches of the west coast of Ireland. The primary object was to assess the relative merits of places designated for possible improvement. At a very early stage the survey team drew up a series of categories into which the places inspected should be divided. These categories were:

(a) Those of importance beyond the areas in which they are situated.
(b) Those of significance within, but not to any large extent beyond the areas in which they are situated.
(c) Those of present minor importance, but with apparent potential.
(d) Those with limited potential.
(e) Those with no potential.

While the five categories set out are not entirely satisfactory throughout the whole length of the west coast of Ireland, they are a very useful set of criteria for most of it, and helped the survey team in coming to decisions.

CAPITAL COSTS

The point naturally arises as to what is meant in terms of money by the three main divisions described in the start of this paper. There can be no universal measurable cost, but it is suggested that in Ireland which has a long heavily indented coastline except along most of the east coast and where the tidal mean spring range varies from a minimum of about 8 ft (2.4 m) to a maximum of 15 ft (4.5 m), the following cost limits apply:

Major fishing ports £250,000 ($600,000) and upwards without limit.

Fig 2. View of Dunmore East harbour prior to commencement of development works in 1963.

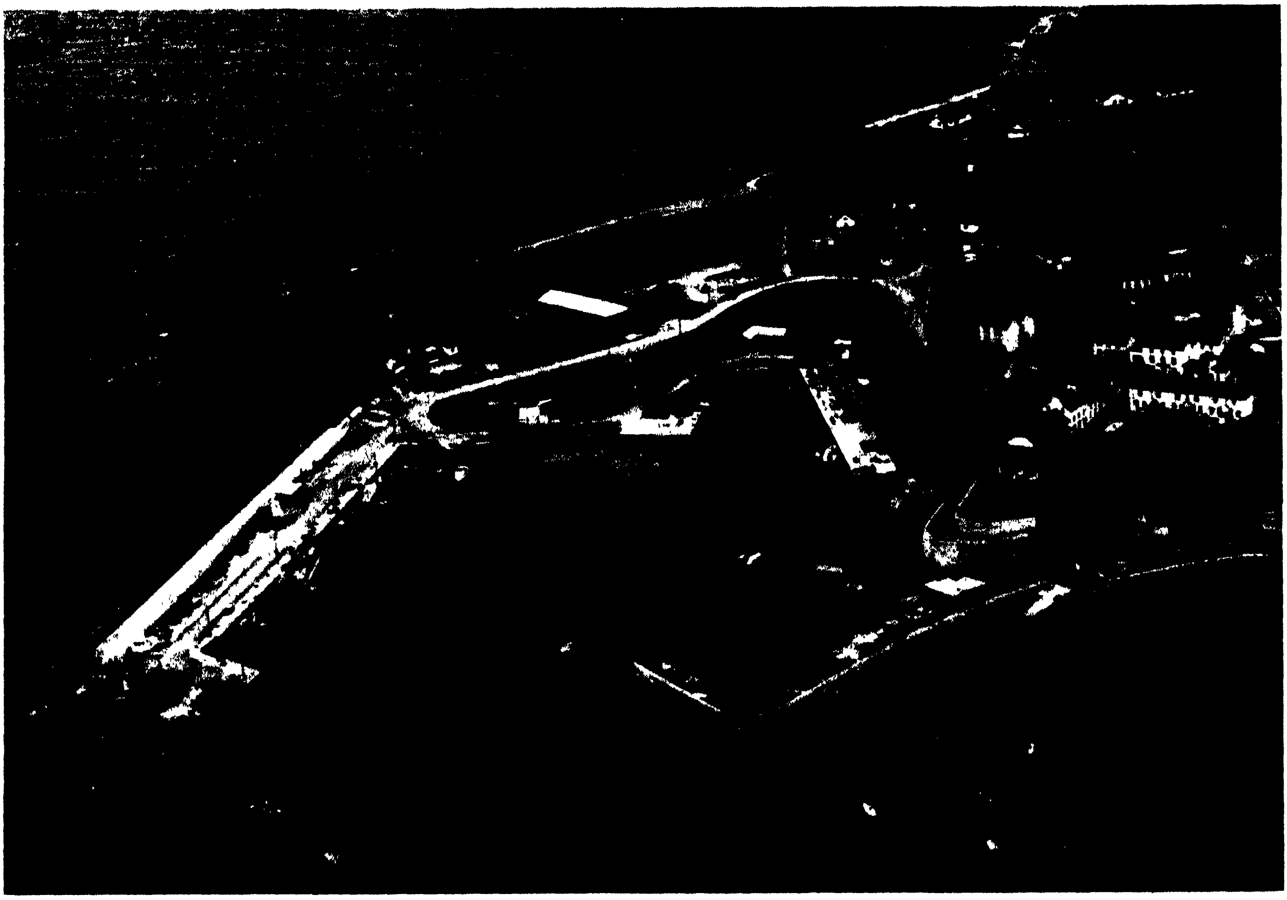

Fig 3. May 1968, and the development works are nearing completion.

Intermediate fishing ports £50,000 to £250,000 ($120,000 to $600,000).

Minor fishing ports, under £50,000 ($120,000).

It is stressed that these sums are those likely to be expended on improving existing facilities, the cost of which if executed nowadays would in many cases equal or exceed the sums mentioned.

The fishing industry and in particular the catching side is as much a human as an economic activity, and relatively as much consideration should be given to developing minor as major ports. Finally, on minor ports if there is a doubt whether or not to spend money the answer should be affirmative. Better a couple of white elephants than one deserted village.

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Preliminary Soil Investigation for Fishing Harbours

by B. Alte

Reconnaissance préliminaire du sol en vue de la construction des ports de pêche

Au nombre des facteurs importants devant être examinés avant la prise d'une décision sur la création d'un port de pêche figurent les conditions du sol au site choisi. Comme une étude complète du sol peut exiger beaucoup de temps et de frais, l'auteur décrit des méthodes relativement expéditives et peu onéreuses permettant d'effectuer une première reconnaissance. Du fait de leur rapidité et de leur bon marché, il est possible d'étudier divers secteurs avant de procéder au choix définitif. L'auteur, après avoir exposé les raisons qui incitent parfois les responsables à ne pas faire d'études préliminaires du sol, souligne que les reconnaissances doivent être effectuées durant les toutes premières phases de l'établissement des plans des ports.

Les méthodes décrites reposent sur le principe du sondage sans prélèvement d'échantillon, suivi le cas échéant d'une reconnaissance plus poussée. L'objectif est de couvrir la totalité de secteur le plus rapidement possible au moyen d'un matériel aisément transportable. On peut avoir recours au sondage par gravité au moyen de tiges d'acier de 22 mm enfoncées sans tube de revêtement par l'application soigneuse de charges allant de 5 à 100 kg. Lorsque, à charge maximale, la pénétration s'arrête, il est imprimé aux tiges et au trépan un mouvement rotatif, et l'on enregistre le nombre de demi-révolutions par 20 cm d'enfoncement. Une variante consiste à procéder de manière analogue avec des tiges d'acier d'un diamètre de 32 mm, qu'enfonce un marteau de 65 kg dont la chute libre est de 50 cm. On relève le nombre de coups, qui fournit une mesure continue de la résistance. Enfin, une autre méthode est le forage pneumatique, avec contrôle attentif de la pression, qui assure là aussi la mesure de la résistance du sol: cette technique permet de traverser des roches de grande taille.

En Suède, on obtient généralement des carottes au moyen d'un collecteur à piston mis au point par l'Institut géotechnique suédois. Pour les échantillons non intacts, on emploie un collecteur à prélèvement latéral. La communication décrit également d'autres méthodes de sondage.

L'auteur mentionne la nécessité de disposer d'un bateau ou radeau approprié à partir duquel effectuer les sondages, et décrit un radeau spécialement conçu pour les forages par faibles profondeurs, qui permit de creuser couramment de 2 à 6 trous par journée de travail.

Investigaciones preliminares sobre el suelo de los puertos pesqueros

Entre los muchos factores importantes que han de estudiarse antes de adoptar decisiones para construir puertos pesqueros se encuentran las condiciones del suelo del lugar del emplazamiento. Un estudio completo del suelo frecuentemente exige tiempo y es caro; en este trabajo el autor describe métodos relativamente rápidos y económicos para realizar un reconocimiento inicial del emplazamiento. La velocidad y baratura de estos métodos permiten realizar estudios de otras zonas antes de elegir definitivamente un lugar. El autor examina las razones por las que a veces los planificadores no realizan estudios preliminares del suelo y pone de relieve que tales investigaciones deben efectuarse al comenzar a planificar las obras portuarias.

El principio de los métodos examinados consiste en realizar sondeos, seguidos de la investigación técnica que sea precisa. El propósito es abarcar toda la zona lo más rápidamente posible y que el equipo se pueda transportar con facilidad. Entre los métodos descritos figura el sondeo por peso, empleando cilindros de acero de 22 mm (0,86 pulgadas) que se introducen en tierra sin tubo de revestimiento por medio de cargas cuidadosamente aplicadas comprendidas entre 5 y 100 kg (11 y 220 libras). Cuando los cilindros dejan de penetrar aplicándoles la carga máxima, se les hace girar junto con sus cabezas de rosca y se registra la cantidad de semirrevoluciones por penetración de 20 cm (8 pulgadas). Otro método consiste en efectuar una penetración similar con cilindros de acero de 32 mm de diámetro (1,25 pulgadas) que se introducen en el terreno mediante un martillo-pilón de 65 kg (143 libras) con una caída libre de 50 cm (19,5 pulgadas). Se registra el número de golpes, lo que proporciona una medida permanente de la resistencia. Otro método que se describe igualmente es el de la perforación pneumática, en la que se controla cuidadosamente la presión del aire; este método proporciona también una medida de la resistencia de los suelos, siendo posible de este modo perforar a través de grandes rocas o piedras.

En Suecia, generalmente se obtienen muestras de suelos no perturbados mediante un tomamiestras de pistón fabricado por el Instituto Sueco de Geotécnica. Las muestras de suelos transformados se obtienen con un tomamuestras de admisión lateral. Se describen también otros métodos de perforación.

El autor indica la necesidad de disponer de una embarcación o una balsa adecuadas desde la que pueda realizar la perforación, y describe una balsa especialmente diseñada para perforar en aguas someras. Desde esta balsa se pueden efectuar normalmente de dos a seis perforaciones diarias.

AT the planning stage of fishing harbours there are a number of different factors to be studied. Among these is soil condition. The erection of a harbour includes relatively large earth movement by dredging and filling, complicated foundation work for quays and piers, and sand migration with possible erosion or sedimentation causing future, maybe even continuous, dredging etc. Soil conditions may therefore influence the cost of the harbour to a great extent.

They vary from site to site—even within closely spaced areas— depending upon geological conditions and also the continuous re-forming and change in soil layers. This takes place along coastal areas influenced by wave action, ocean and tide-water currents, river deposits etc. As the proposed sites for fishing harbours are covered by water, an inspection of the area will give insufficient detailed information, and borings are normally required even for preliminary estimate and judgement.

The soil conditions here refer to both **geological conditions** concerning the extent and thickness of the different soil layers, the quality and surface of bedrock etc., and the soil mechanics aspect concerning **the technical properties** of the soil layers with reference to compressibility, compactness, sheer strength and other characteristics.

SOIL MECHANICS IN THE PLANNING STAGE

Planning of a fishery harbour generally commences with an economic study of the resources of fish, the market, transport conditions, size of ships, fishing traditions of the population, and other factors. This may result in a proposal for a fishing harbour within a certain area with a few alternative sites.

Thereafter an engineering study will decide the size, shape and possible design for development at the different sites, and from this an estimate of costs can be made. To obtain this information, a study of hydrographical and soil conditions must be made. The more information available, the better will be the results.

The author wishes to stress the importance of not postponing soil investigation until the end of the planning stage. Preliminary investigations should be made at an early stage at the alternative sites with a detailed investigation for the finally chosen harbour in connection with the design of quays, piers and other structures. A preliminary soil investigation, in connection with the preliminary hydrographical investigations should be regarded as absolutely necessary.

ARE SOIL CONDITIONS GIVEN NECESSARY ATTENTION?

There are several examples where soil investigations were not made. The preliminary planning of these harbours was based on more or less estimated conditions, and actual soil conditions were discovered too late to avoid difficulties and damage. Possible causes for these omissions might be as follows:

Determination of the geotechnical and hydrological conditions involves work at the actual sites, which in certain cases are decided to be inappropriate until an official decision on the harbour development has been made.

The site investigation often includes the engagement of a sub-contractor, and this increases both the projecting team and the time required for planning.

If soil investigations are made, the cost of planning will be higher, and this unfortunately can be given greater consideration than the total cost of the whole project.

Often it is stated that the soil conditions are given premises that cannot be changed, and the costs cannot be avoided. This might be true at the design or construction stage, but not in the preliminary stage when alternative proposals can be considered.

INVESTIGATION METHODS

Quite often, a valid reason for preliminary soil investigations not being conducted, is that some of the internationally used investigation methods are time-consuming and not suitable for reconnaissance investigations. One can also understand the difficulties the harbour-engineer has in knowing about all the different investigation methods that exist or have been and are being developed within this field.

The soil investigation methods used in Sweden are particularly well suited for preliminary surveys carried out in the shortest possible time. The principle of the methods is to carry our penetrating borings followed by qualified investigations where necessary. The penetrating borings are made to determine the geology of the area with respect to the different soil layers, their characteristics, extent and thickness over bedrock or to a certain depth. The qualified investigations are made to determine the technical properties at points chosen with respect to the geology of the area as well as the lay-out plan for the harbour.

The preliminary investigation is made with the intention of covering the whole area with penetrating borings. These borings are quickly done as the equipment is easily transportable. This is a great advantage as the work is done mostly at sea and in areas with difficult road communications. The number of qualified investigations at this stage are limited to shorten the investigation period and the costs.

The extent of a preliminary investigation cannot be determined in detail beforehand. The number and type of borings must, to a large extent, be determined as the site investigation is proceeding. An important condition is therefore that the engineer in charge of the work shall have experience with the investigation methods and their interpretation as well as a theoretical background, so that he, in conference with the harbour engineer, can propose changes in the investigation programme as required.

In Sweden, soil investigations are mainly conducted by consulting engineering firms with equipment, laboratory and an experienced field-staff under the leadership of a consultant in soil mechanics. Such a group is normally at the harbour designer's disposal as consultants for the soil mechanics aspects of the placing and erection of the fishing harbour.

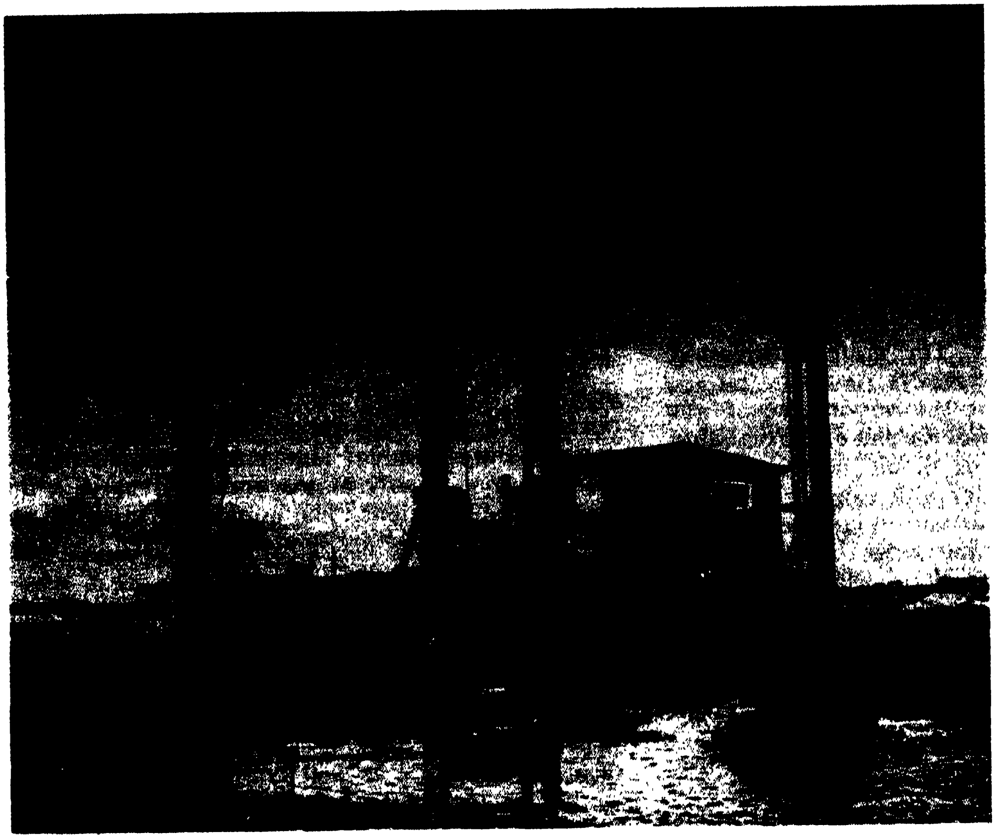
INVESTIGATION METHODS STANDARDIZED IN SWEDEN

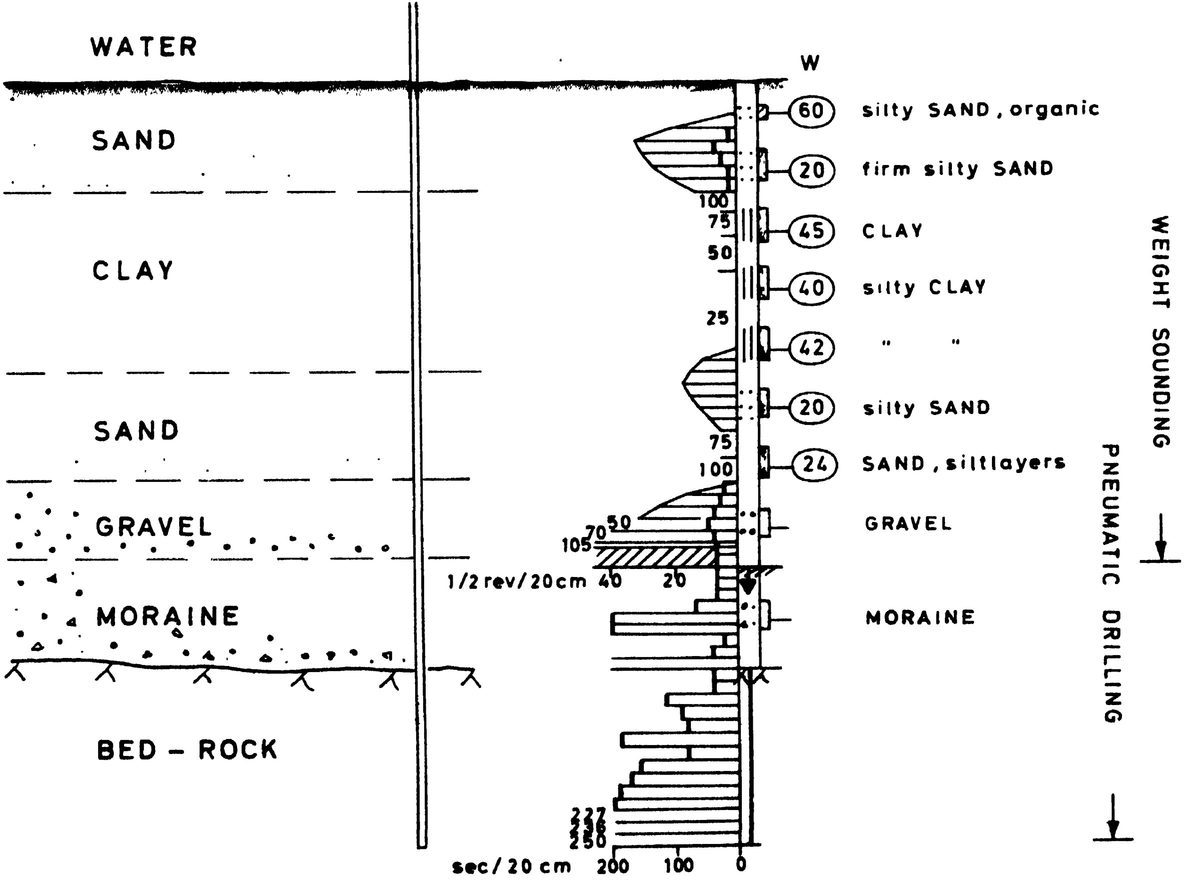
Here is a short description of the different drilling methods standardized in Sweden.

Weight sounding

The equipment consists of a screw-head about 32 mm (1.25 in) in diameter fitted to 22 mm (0.86 in) steel rods which can be extended by joining additional steel rods. The screw-head and rods are sunk without a casing-tube. During operations, loads are applied to the rod and the weight required for penetration is carefully recorded for the loads 5, 15, 25, 50, 75 and 100 kg (11, 33, 55, 110, 165 and 220 lb). When the rod has ceased penetrating into the ground under a load of 100 kg (220 lb), it is rotated—still under maximum vertical load—to force the screw-head at the end to penetrate further into the ground. The number of half revolutions per 20 cm (8 in) penetration is recorded and subsequently used in the form of a diagram (fig. 2).

This diagram will provide a direct measurement of the soils' resistance to drilling, furnishing an indication of the stiffness and compactness of the soil. For a detailed





Figs 1 and 2. Drilling raft working in tidal area at low tide (Tidal range 5 m. approx.). (Below) diagram showing results of weight sounding, pneumatic drilling and sampling.

study of the engineering properties of the soil, sampling is necessary.

The drilling method is classed as a penetration test and can be compared with Dutch sounding. It provides information as to the compactness of the various layers of soil and, when handled by an expert borer also gives a brief idea of the type of the soil.

Hammer sounding

Hammer sounding is also a penetration test useful in comparatively stiff soils. A steel rod with a diameter of 32 mm (1.25 in) is driven into the ground by a 65 kg (143 lb) hammer with a free drop of 50 cm (19.5 in). The rod has a point with a square cross section 40 × 40 mm (1.6 in × 1.6 in) and a length of 200 mm (8 in). The number of hammer blows necessary to drive the rod 20 cm (8 in) are recorded and shown in a diagram. In this way a continuous measurement of the resistance against penetration is established.

The hammer sounding method can be compared with the standard penetration test but its advantages are that the hammer sounding gives a continuous record of the soil layers and no casing is needed. The sounding diagram usually gives a good indication of the variation in the soil layers and to some extent also provides information as to their relative compactness.

Hammer sounding is frequently used in order to find the length of end-bearing piles as the possible penetration depth in most soils corresponds to the pile lengths.

Pneumatic drilling

Pneumatic drilling is a more powerful penetration test. It is carried out with a compressed-air-operated rock-drilling machine. The drill rods are generally composed of 2.4 m (7.9 ft) lengths, capable of being joined together, and fitted to a 50 mm (2 in) or 63 mm (2.5 in) rock drill bit. Compressed air or pressurized water is used for flushing the borehole. In order to obtain a relative comparison between the results of the various boreholes, the air pressure supply to rock drill, motor feed and flushing is kept constant during the drilling operation and checked by means of pressure gauges. The time required for the drill to penetrate 20 cm (8 in) of soil or rock is recorded to form the basis for a diagram (fig. 2).

Compared with ordinary penetrative drilling methods, the great advantage of this method is the ease with which it is possible to drill through large blocks or boulders and thus reach down to and into bed-rock.

An experienced borer is able to determine roughly the type of soft soil layers, the hardness of the rock as well as the existence or prevalence of large fissures. Thin horizontal cracks may be observed, but will not appear in the diagram, although their existence will be duly recorded by the borer.

It is normally considered sufficient to drill between 3 m (9.9 ft) and 5 m (16.5 ft) into bed-rock for accurate determination of the bed-rock level. In some cases the crushed rock material from the borehole can be collected and the type of rock roughly determined by examination.

Pneumatic drilling is too powerful for a detailed determination of the type of soft soil layers. For such purpose, the weight sounding method is more appropriate. Both methods can, however be advantageously applied to one and the same borehole.

Soil sampling methods

In Sweden, undisturbed soil samples are obtained by a piston sampler, which was standardized after intensive studies and tests carried out by the Swedish Geotechnical Institute (described in Proceedings Nos. 19 and 20).

The sampler has proved to be well suited for undisturbed sampling of clay and soft soils in particular, and has been in use in Sweden for almost 10 years.

Disturbed samples are obtained with a side intake sampler or with a Craelius soil sampler which is an open split spoon sampler with diameter 63 mm (2.6 in) and the length 600 mm (23 in).

With the soil sampling methods described comparatively small samples are obtained. Experience has shown that these samples are quite sufficient for fine-grained sedimented material but for coarse, inhomogeneous and firm material larger samples are desirable if more detailed laboratory investigations are necessary.

For preliminary investigations the smaller samples are quite sufficient in most cases. At this stage it is more valuable to get samples from several points and at varying depths covering the whole area than to concentrate a detailed and more costly sampling on very few points.

Other borings

In-situ vane borings are made in clay or clayey soils for the determination of sheer strength. Vane borings are carried out after determination of the types of soils through disturbed or undisturbed sampling. The borings are usually made without casings and are therefore quickly done. For preliminary investigations, vane borings are helpful in establishing some of the technical properties of the soil.

Rock-core sampling is a more time-consuming and complicated method to use when borings take place at sea. The method should therefore not be used in the preliminary stages, as the information obtained is usually required for the detailed studies of harbour-construction, which are not covered in this paper.

DRILLING RAFT

The most important problem from a practical point of view is to find a boat, barge or raft from which the borings can be carried out. Especially in non-industrial countries, suitable boats or barges are seldom available in areas where a fishing harbour is planned. Also the possibilities of transporting these by sea or by land to the site from a nearby commercial harbour may be small.

In order to solve this problem, a specially designed demountable raft often has to be used, and in the figure, an example of such a raft is shown. This raft can be transported by land and assembled at the investigation site. It consists of a floating platform with four spud legs on which the platform can be lifted above the water. No anchors are necessary and by using two outboard motors the raft can be moved within the site area (fig. 1).

The advantages are that the work can be carried out with less dependence on the waves, streams and other site conditions and with a higher safety factor with regard to possible accidents. The raft has been found to speed up the work considerably.

CAPACITY OF DRILLING

The necessary time to carry out the investigation is, to a very high degree, dependent on the barge or raft used, e.g. the possibilities to move between the boreholes and to work under bad weather conditions. Using the penetrating methods described above, a capacity of 2 to 6 boreholes per working day is normal. Sampling, vane tests and especially rock-core drilling is more time-consuming and each borehole may take ½ to 2 days and maybe even more depending on the soil conditions.

SUMMARY

Knowledge about the soil conditions at an early stage of the project is most valuable for the selection of a suitable site and the design of the fishing harbour.

The preliminary soil investigation should give brief but reliable geological-geotechnical indications with regard to sand drift, dredging, blasting, foundation of quays and piers, and other structures.

The preliminary investigation must, because of practical reasons, be relatively quick, simple and inexpensive, but still qualified to give information for further planning.

From this point of view the investigation methods here described from experience, have been shown to be very suitable not only in Scandinavia but also in countries with differing geological conditions.

Considérations Concernant les Projets de Ports de Pêche

par V. B. Marchal et A. Ceresa

Considerations in fishing port projects

In the first part of this paper the authors discuss the general question of the planning of fishery harbours, and in the second part they outline a specific instance where alternative designs for a given site were made.

The authors first discuss the characteristics of a fishing port and determine the necessary facilities for operating vessels and for handling the catch. Both inshore and ocean fishing ports are compared. The authors discuss the factors influencing the choice of site and stress the importance of two factors (a) the need for sheltered water and (b) the necessity for good communications with consuming areas. They suggest that it is important too to make adequate provision for future development.

In planning the port the engineer must take into account the likelihood of future developments and the size and character of the fleet. It is necessary too to obtain a good knowledge of the oceanographic, hydrographic and meteorological conditions. The authors discuss the requirements for handling both fresh fish and frozen fish and the many facilities required.

In the final section the authors mention specific difficulties particularly those concerned with finance and the almost inevitable increases in the final cost of harbour projects as compared with the initial price. Difficulties too are frequently met with in the determination of the sub-soil.

In Part 2 the authors describe the proposal for the development of a fishing port in a tropical country and outline the initial conditions and the various alternative ways of meeting the original specification. This is done by a number of alternative layouts of quays, buildings and other facilities. It also includes some proposals for an increase in the land area of the port by reclamation.

Consideraciones sobre los proyectos de puertos pesqueros

En la primera parte de este estudio los autores examinan la cuestión general de la planificación de puertos pesqueros, y en la segunda parte exponen un caso concreto en el que se hicieron diferentes proyectos sustitutivos para un emplazamiento dado.

Los autores examinan, en primer lugar, las características de un puerto pesquero y determinan las instalaciones y servicios necesarios para las embarcaciones así como para la manipulación de las capturas. Se comparan los puertos para pesca costera y de alta mar. Los autores analizan los factores que influyen en la elección del emplazamiento y ponen de relieve la importancia de dos factores: (a) la necesidad de que sean aguas abrigadas; y (b) la necesidad de buenas comunicaciones con las zonas consumidoras. Indican que también es importante prever la futura ampliación.

Al proyectar el puerto el ingeniero debe tener en cuenta la probabilidad de futuras evoluciones y el tamaño y clase de las embarcaciones. También es preciso obtener un buen conocimiento de las condiciones oceanográficas, hidrográficas y meteorológicas. Los autores examinan los requisitos necesarios para la manipulación de pescado fresco y de pescado congelado y las muchas instalaciones y servicios que hacen falta.

En la última sección los autores mencionan determinadas dificultades específicas, en especial las de tipo económico y los aumentos casi inevitables del costo final de los proyectos de los puertos respecto al cálculo inicial. Frecuentemente surgen también dificultades con respecto a la determinación de la naturaleza del subsuelo.

En la segunda parte los autores describen la propuesta para el desarrollo de un puerto pesquero en un país tropical y esbozan las condiciones iniciales y las varias alternativas existentes para cumplir las exigencias originales. Esto se consigue preparando diversos proyectos alternativos para los muelles, locales y otras instalaciones y servicios. Incluye también algunas propuestas para aumentar la superficie firme del puerto ganando tierras al mar.

1ère Partie

UN port de pêche est un ensemble complexe. En raison des nombreux facteurs qui sont en jeu, sa planification peut donner lieu à des solutions très différentes. Dans la pêche, comme partout, nous assistons à un bouleversement des habitudes passées. Il y a cinq ans, le premier pétrolier de 100.000 TDW a stupéfait. On compte maintenant par centaines les pétroliers, minéraliers, porte-containers qui s'échelonnent de près de 100.000 T jusqu'à 312.000 T et on arrivera peut-être à 500.000 T et même 1.000.000 T. De même pour les navires de pêche, les chalutiers de 300 TDW sont dépassés par les 700 T et 2.000 T. Les navires usines de 20.000 T parcourent les mers accompagnés d'une flotille de chalutiers et viennent décharger dans les ports de pêche des produits déjà conditionnés et emballés. Le poisson est livré soit entier congelé, soit fileté, emballé prêt à être cuisiné. Certes, il faut, pour des raisons humaines et économiques réserver sa place à la pêche artisanale, tout en tenant compte qu'elle se modernise, mais en restant néanmoins limitée à la pêche côtière.

A cette évolution de l'industrie de la pêche doit correspondre une évolution des caractéristiques des ports de pêche pour permettre l'exploitation des nouveaux navires: plans d'eau de plus en plus importants pour permettre la manoeuvre de ces derniers; profondeur des ports accrue; longueur des quais plus grande; infrastructure adaptée à la nature des produits débarqués. Malgré les études de prospective entreprises, que réserve l'avenir aux modestes ports de pêche entièrement nouveaux que l'on projette aujourd'hui? Une réponse partielle à cette question serait la suivante: les bâtiments mères ou les navires usines devront utiliser pour leurs opérations non des ports de pêche mais des ports de commerce. Dans ce qui va suivre, nous n'avons pas la prétention de faire une étude exhaustive sur les ports de pêche. Nous nous sommes contentés d'exposer quelques considérations sur les points que nous estimons le plus importants:

(a) caractéristiques des ports de pêche;
(b) choix du site;
(c) planification d'un port de pêche;
(d) quelques difficultés rencontrées dans nos études et réalisations.

Nous présentons dans la deuxième partie une situation à laquelle nous avons eu à faire face.

CARACTERISTIQUES D'UN PORT DE PECHE

Rôle du port de pêche

Qu'ils s'agisse d'un port de pêche pour navires côtiers ou pour navires océaniques, un port de pêche doit remplir un certain nombre de conditions.

(a) Il doit être un abri: non seulement pour les navires fuyant le mauvais temps, mais son plan d'eau doit être protégé contre la houle pour permettre aux navires de rester à quai en toutes circontances.
(b) Il doit disposer de moyens pour le débarquement rapide du poisson et son acheminement vers les lieux d'exploitation:
    poissons frais: triage, marché, expédition,
    poissons congelés: entrepôsage, conserverie, réexpédition.
(c) Il doit pouvoir assurer le ravitaillement des navires:
    vivres
    carburants, huiles
    engins de pêche
    pièces de rechanges
    etc.
(d) Il doit disposer de moyens de réparations et d'entretien.
(e) Disposer d'installations sociales.
(f) Permettre le développement éventuel d'industries annexes.

Caractéristiques

Un port de pêche est donc un ensemble extrêmement complexe dont la conception peut être influencée par de multiples facteurs:

espèces de poissons débarqués et leur présentation
types et dimensions des navires qui le fréquentent
etc.

Néanmoins certains principes d'installations sont communs.

(a) Le plan d'eau devra être assez vaste pour permettre l'évolution des navires. Il faut envisager l'avenir pour la détermination de sa surface.
(b) Les zones réservées au débarquement, au ravitaillement et aux réparations devant être nettement séparées, il convient de prévoir des quais distincts pour ces diverses opérations:
    quais de débarquement
    quais de ravitaillement
    quais de réparations.
    Les navires en attente de départ pouvant utiliser soit les quais de ravitaillement soit ceux de réparations.
(c) Les installations et équipements devront permettre un transfert rapide du poisson vers les lieux de triage ou de stockage et des moyens d'évacuation (camions, chemin de fer) du poisson destiné soit à la consommation nationale soit à l'exportation.

Port de pêche cotier

Un tel port est caractérisé par la présence de nombreux navires de petites tailles et de faible tirant d'eau. Les apports consistent en poissons frais conservés sous glace pour le marché local ou expédition à l'intérieur du pays. Ce port sera construit autour de son marché au poisson. En dehors des dispositions prévues au paragraphe 2.1 ci-dessus il faudra prévoir les installations ou opérations suivantes:

débarquement du poisson
triage, préparation de la vente
criée, installations pour mareyeurs
gare d'embarquement sur camions ou wagons pour expédition à l'intérieur du pays
ravitaillement en glace des navires et mareyeurs
entrepôt frigorifique avec possibilités de congélation

Le marché aux poissons sera situé en face du quai de débarquement. Les navires devront si possible être amarrés obliquement au quai pour gagner de la place.

Port de pêche océanique

Un tel port est destiné à des navires de pêche importants: longueur de 40 à 120 mètres et de fort tirant d'eau. D'ou plan d'eau profond et longueur de quais importante. Les apports consisteront en:

poissons congelés (entiers ou en filets)
poissons salés ou fumés
conserves de poissons
farine ou huile de poissons.

L'infrastructure principale d'un tel port sera son entrepôt frigorifique. Ce dernier sera construit en face du quai de débarquement, les navires seront amarrés bord à quai. De tels ports entraîneront fatalement l'installation d'industries de transformation dont il sera nécessaire de prévoir les implantations.

CHOIX D'IMPLANTATION DU SITE

Les conditions nécessaires

Les deux conditions qui nous paraissent primordiales sont:

(a) l'abri;
(b) les possibilités de distribution du poisson à l'intérieur du pays et les possibilités de transport vers un port de commerce pour le poisson destiné à l'exportation.

Par abri il faut comprendre les possibilités de refuge en cas de mauvais temps mais aussi la nécessité de disposer d'un plan d'eau sans levée due à la houle. Cette considération orientera le choix vers un abri naturel si la topographie et l'hydrographie de la côte le permettent.

Dans le cas contraire le choix sera orienté par les conditions de distribution et de transport:

(a) pour la distribution du poisson à l'intérieur du pays: proximité de voies de communications routières ou ferrovières;

(b) pour le poisson destiné à l'exportation: proximité d'un port de commerce. Si cela est impossible il faudra prévoir dans le port de pêche des postes d'accostage de bâtiments de transport frigorifiques importants.

Les autres considérations

Mais les deux conditions ci-dessus étant satisfaites, il existe d'autres exigences à prendre en considération.

Les possibilités d'extension futures pour lesquelles il faudra disposer de nouveaux plans d'eau et de nouvelles surfaces de terrain. Celles-ci pourront être obtenues soit par remblaiement soit en bloquant la spéculation sur les terrains qui seront nécessaires un jour, en prenant des arrêtés gouvernementaux de zones d'urbanisation et d'industrialisation différées. Il ne faut pas que le modeste premier projet de port interdise, dans les décennies à venir, son adaptation aux besoins futurs. C'est là un but qui peut être très difficile à atteindre en raison des faibles crédits mis initialement à la disposition de l'organisme créateur du port, en particulier dans les pays en voie de développement où les problèmes de financement sont difficiles à résoudre.

Enfin, il ne faudra pas négliger les possibilités suivantes:

(a) recrutement de la main-d'oeuvre;

(b) proximité d'un centre industriel où seraient installés les représentants des principaux matériels d'équipement.

PLANIFICATION DU PORT DE PECHE

L'installation d'un port de pêche moderne demande de grandes surfaces terrestres et un important plan d'eau.

Les surfaces terrestres peuvent être:

(a) soit prises sur la terre ferme lorsque la profondeur nécessaire au plan d'eau est à proximité de la côte;

(b) soit gagnées sur la mer par dragage et remblayage lorsque les profondeurs naturelles sont insuffisantes.

Le plan d'eau, en cas de port naturel, est déterminé par les conditions topographiques et hydrographiques locales. Dans un port artificiel il risque d'être limité par le coût des ouvrages (jetées, brise-lames) nécessaires pour assurer sa protection.

Les informations de base

Avant d'entreprendre sa planification, l'ingénieur devra savoir si le port ne sera jamais conditionné que pour la pêche locale artisanale un peu évoluée donc avec accès et des installations modestes, ou au contraire, que dans un avenir plus ou moins éloigné ce port peut être appelé à un trafic plus important, en raison de sa situation locale, nationale ou même mondiale.

Sans augmenter les investissements pour un premier port l'ingénieur doit donc se préoccuper de réserver les possibilités pour:

(a) un nouveau développement de l'ensemble du port;

(b) un nouveau conditionnement des produits de la pêche;

(c) l'accès et l'évolution de plus grands navires.

La flotte

Il sera indispensable également de connaître le nombre et les caractéristiques des navires qui seront basés dans le port d'une façon permanente ou des navires pouvant y faire escale occasionnellement, ainsi que la fréquence de leur séjour dans le port. Il sera également nécessaire de connaître les espèces de poissons qui seront débarquées, leur présentation et leur utilisation future.

Ces renseignements permettront de déterminer:

(a) d'une part la profondeur des plans d'eau et la longueur des quais;

(b) d'autre part les infrastructures à prévoir et leur importance relative.

Les conditions géophysiques

Après avoir défini les éléments ci-dessus il faudra définir les ouvrages devant assurer la protection du port: jetées, brise-lames, etc.

Pour cela une étude approfondie des conditions météorologiques, de l'hydrographie et de l'océanographie locales sera indispensable.

Dans les zones où le mauvais temps est fréquent et où les courants et la nature des fonds sont tels que l'on puisse craindre soit de la levée dans le port ou des phénomènes de résonance (seiches) soit des ensablements ou des envasements, il peut être à conseiller de vérifier sur modèle réduit si les dispositions adoptées suppriment ou atténuent de façon satisfaisante ces phénomènes.

Planification des infrastructures terrestres

La définition des fondations des infrastructures dépend de la nature du sous-sol qui devra être parfaitement connue jusqu'au rocher. Il ne faut pas se fier aux renseignements qui peuvent être fournis que si l'on peut être en possession des résultats complets d'une investigation sérieuse. En effet, si le sous-sol dans l'intérieur des terres peut être homogène, il n'en est pas de même sur le littoral où peuvent se trouver par endroit des poches de terrain compressible.

Débarquement du poisson frais—port de pêche artisanale. La manutention se fera de nuit afin d'éviter les gros écarts de température. Elle devra être organisée de façon que le poisson puisse être déchargé, trié, vendu, mis en caisse par les mareyeurs et chargé sur les moyens de transport au milieu de l'après-midi. Le marché au poisson sera implanté le long du quai et à une dizaine de ce dernier. Sa largeur sera calculée pour permettre:

côté quai: le triage du poisson et sa mise en bacs pour la vente,

au milieu la halle de criée,

sur l'autre côté l'installation des entrepôts ou magasins des mareyeurs.

Un terre-plein extérieur pour le chargement sur camions frigorifiques. Le déchargement du poisson pourra êtra effectué par un va-et-vient actionné par un treuil électrique mobile installé devant le poste d'amarrage des navires. Le poisson sera transporté par tapis roulant vers les tables de triage.

Débarquement du poisson congelé—port de pêche océanique. La manipulation pourra se faire à n'importe quelle heure du jour, mais devra être conduite assez rapidement pour éviter un stationnement prolongé du poisson en dehors des chambres froides. L'entrepôt frigorifique devra être implanté autant que possible en face du quai de déchargement, à une distance permettant la circulation de camions sur ce dernier. C'est pourquoi le meilleur moyen de déchargement sera le trolley aérien jusqu'à l'entrepôt et éventuellement vers les chambres froides. Nous pensons que pour faciliter la gestion de l'entrepôt, l'automatisme devra être aussi poussé que possible: pesée automatique, dispatching dans les chambres froides, comptabilisation des stocks à l'entrée et à la sortie de ces dernières.

Ravitaillement. Le quai de ravitaillement devra êtra suffisamment large pour permettre le trafic des camions apportant aux navires les vivres et matériels divers. A proximité de ce dernier il faudra disposer d'un très grand terre-plein où seront implantés entrepôts et magasins. Ce quai devra être équipé de canalisations d'eau douce et si possible d'air comprimé. Le ravitaillement en carburants pourra se faire par distribution canalisations installées sur le quai ou par citernes flottantes. L'huile sera distribuée en fût ou par camions citernes. La glace destinée aux navires sera produite par une usine installée sur une des extrémités du quai de ravitaillement (délivrance par gravitation au navire amarré sous cette fabrique) ou par une fabrique de glace installée dans le frigorifique et distribuée par tapis roulant aérien ou par camions spéciaux; cette fabrique fournira également la glace pilée destinée aux mareyeurs.

Réparations. Le complexe des réparations comprenant: le quai des réparations, les ateliers et les slipways ou cales sèches sera planifié suivant les conditions locales. Il faudra prévoir au moins deux slipways correspondant à des tailles de navires différents, une rampe de hissage pour les petites embarcations et s'il est possible la construction d'une cale sèche serait souhaitable. Prévoir également les moyens de manutention grues, etc.

Bureaux de direction. Ces derniers devront être installés de façon à avoir une vue d'ensemble sur le plan d'eau et les quais pour pouvoir surveiller les mouvements des navires.

Sécurité. Le port devra disposer des moyens nécessaires pour combattre les incendies tant à terre que sur les navires ainsi que des moyens de lutte contre les voies d'eau à bord.

Industries annexes. Suivant les demandes il faudra également prévoir des terre-pleins pour l'installation d'industries et services annexes:

conserveries
usines de farine et huile de poisson, de salage ou de séchage
garages
postes
banques

DIFFICULTES RENCONTREES

Dans les études portuaires ou réalisations qui nous ont été confiées nous nous sommes heurtés à un certain nombre de difficultés. Elles out été certainement rencontrées par toutes les sociétés s'intéressant aux mêmes problèmes, il nous a semblé néanmoins utile d'en rappeler les principales.

Questions financières

L'intérêt de la pêche n'est plus à démontrer, qu'il s'agisse de la nourriture des populations ou d'un moyen de se procurer des devises étrangères. Mais dans la plupart des pays l'industrie de la pêche est considérée comme un parent pauvre. Les plans à long ou moyen terme sont en général orientés vers des réalisations plus spectaculaires. Les crédits affectés à la pêche sont modestes et distribués avec parcimonie. Il est alors nécessaire de faire une planification par phases de réalisation dont chacune représente néanmoins un ensemble cohérent, dont l'exploitation soit saine commercialement. Ce n'est pas toujours chose facile.

Choix du site

Dans le cas où le choix du site n'est pas imposé, les difficultés sont connues; il appartient à l'ingénieur conseil de les surmonter, c'est son métier. Par contre des difficultés importantes sont rencontrées lorsque le site est imposé, que certains ouvrages ont déjà été réalisés par les organismes responsables du port. Il n'est pas question de démolir, il faut adapter et ce n'est pas toujours chose facile.

Il n'est pas possible d'entrer dans le détail de toutes les difficultés qui peuvent se présenter, ce serait trop long et la liste en serait incomplète. Nous nous contenterons d'indiquer les difficultés les plus importantes auxquelles PROMOPECHE s'est heurtée.

Les ouvrages réalisés ne l'ont pas été conformément aux plans fournis. Il est donc nécessaire de vérifier l'exactitude de ces plans tant du point de vue topographique qu'hydrographique.

Connaissance du sous-sol. Ainsi que nous l'avons indiqué plus haut cet élément est primordial à la planification et au calcul des fondations des ouvrages. Certains d'entre eux ne peuvent supporter de déformations: entrepôts frigorifiques en raison des isolements des chambres froides, ateliers mécaniques à cause des ponts roulants et de certaines machines de précision, slipways qui ne peuvent supporter de dénivellations de plus de quelques centimètres.

Une attention suffisante n'a pas été accordée aux conditions météorologiques ou océanographiques et les ouvrages de protection prévus ne mettent pas le plan d'eau du port à l'abri des effets de la houle, de seiches dues à des phénomènes de résonances difficiles à prévoir a priori, enfin à des ensablements ou envasements.

C'est pourquoi, malgré l'effort financier que cela peut représenter, nous ne pouvons que recommander dans les cas difficiles, de faire une étude du port sur modèle réduit. Une telle opération pourra éviter des dépenses beaucoup plus importantes par la suite.

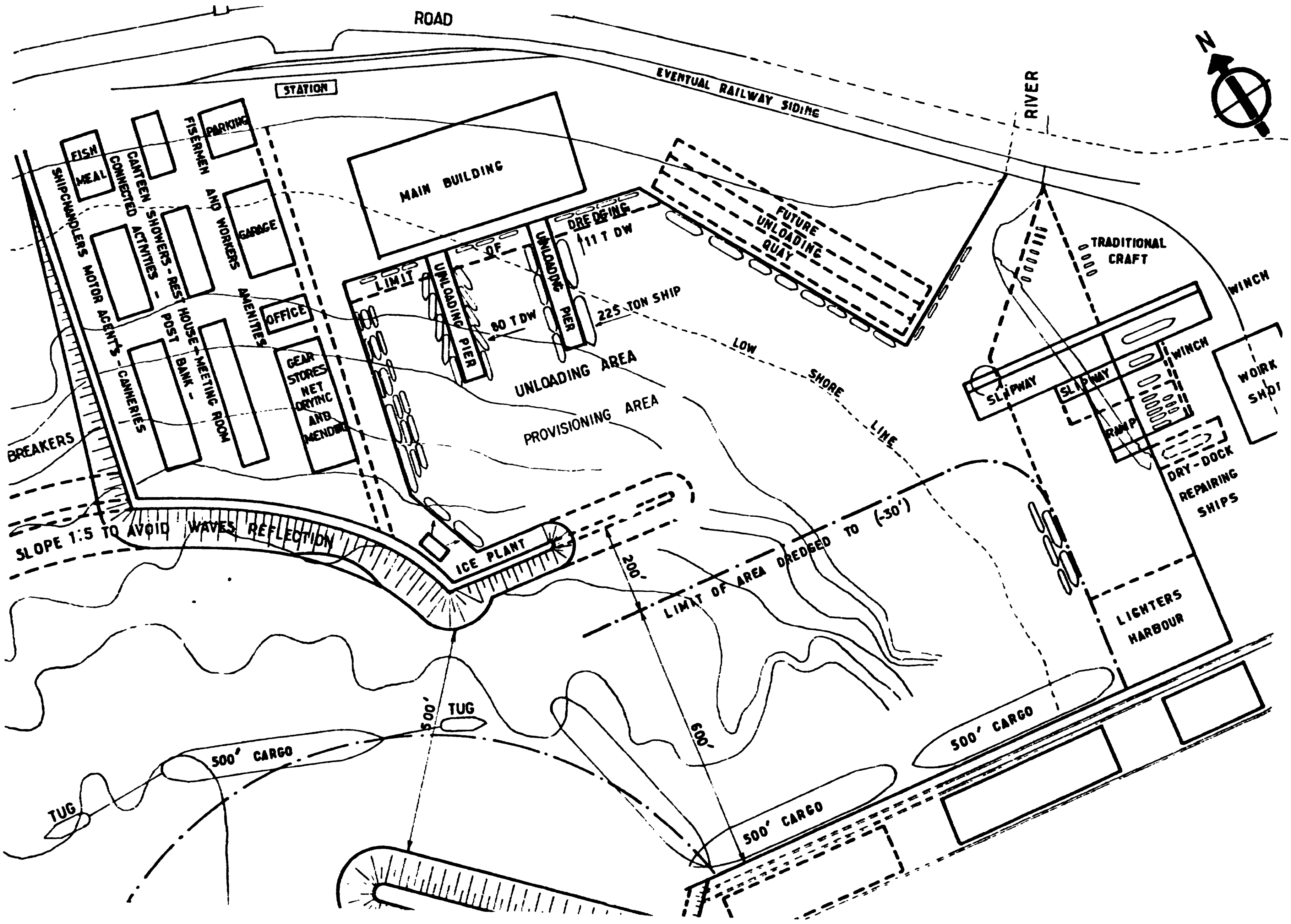


Fig. 1. Alternative A Promopeche Citra

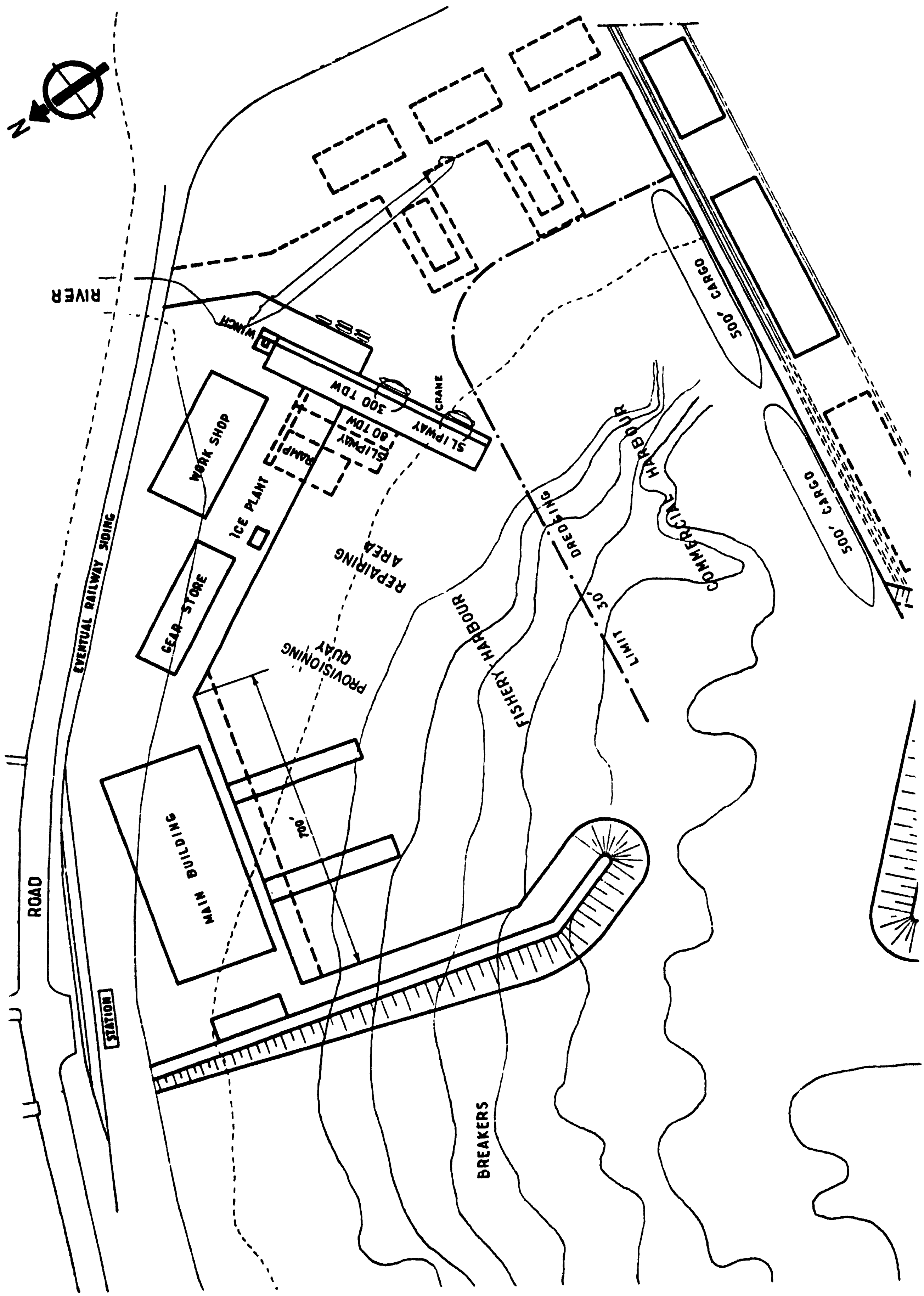


Fig. 2. Alternative B Promopeche Citra

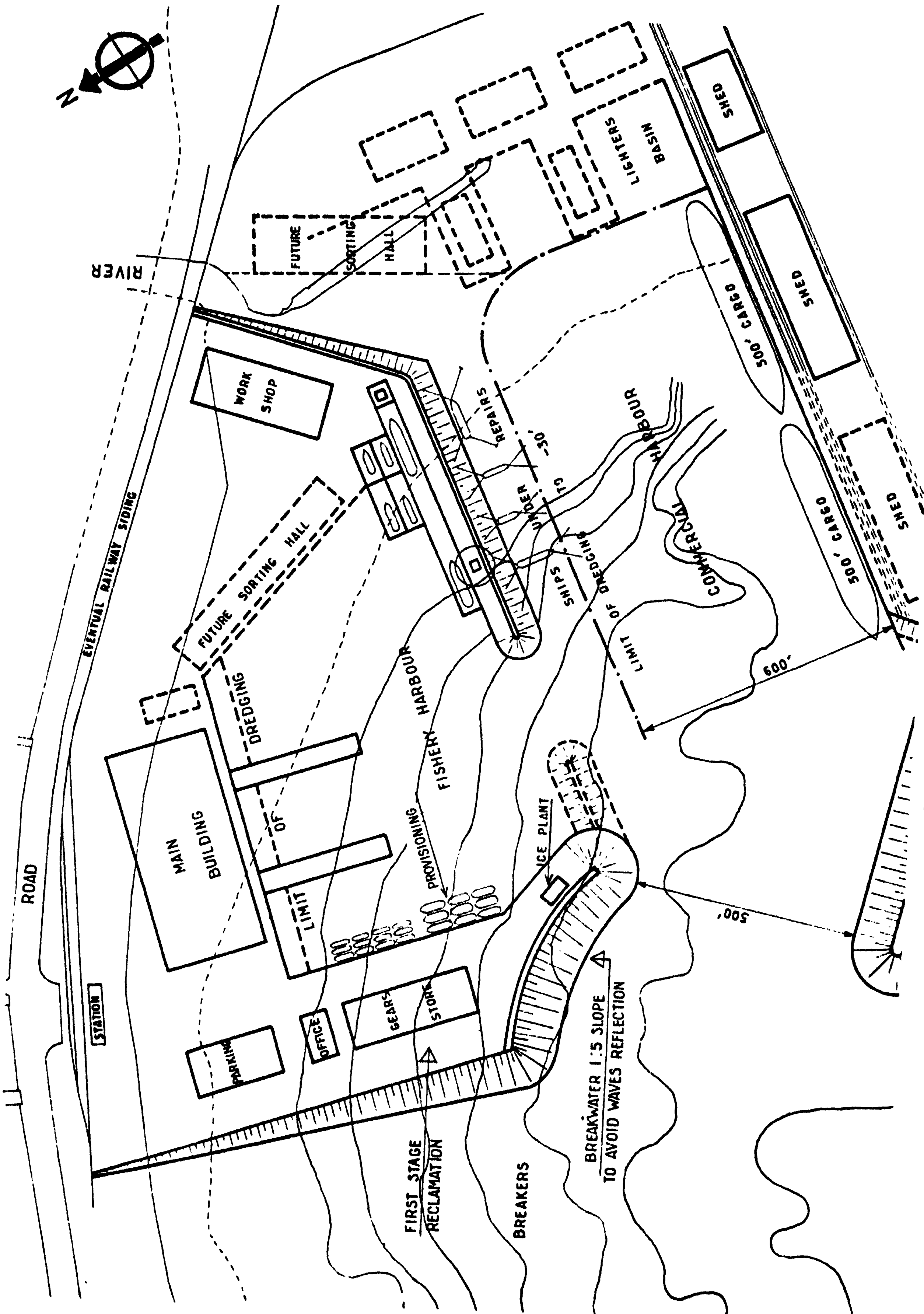


Fig. 3. Alternative C Promopeche Citra

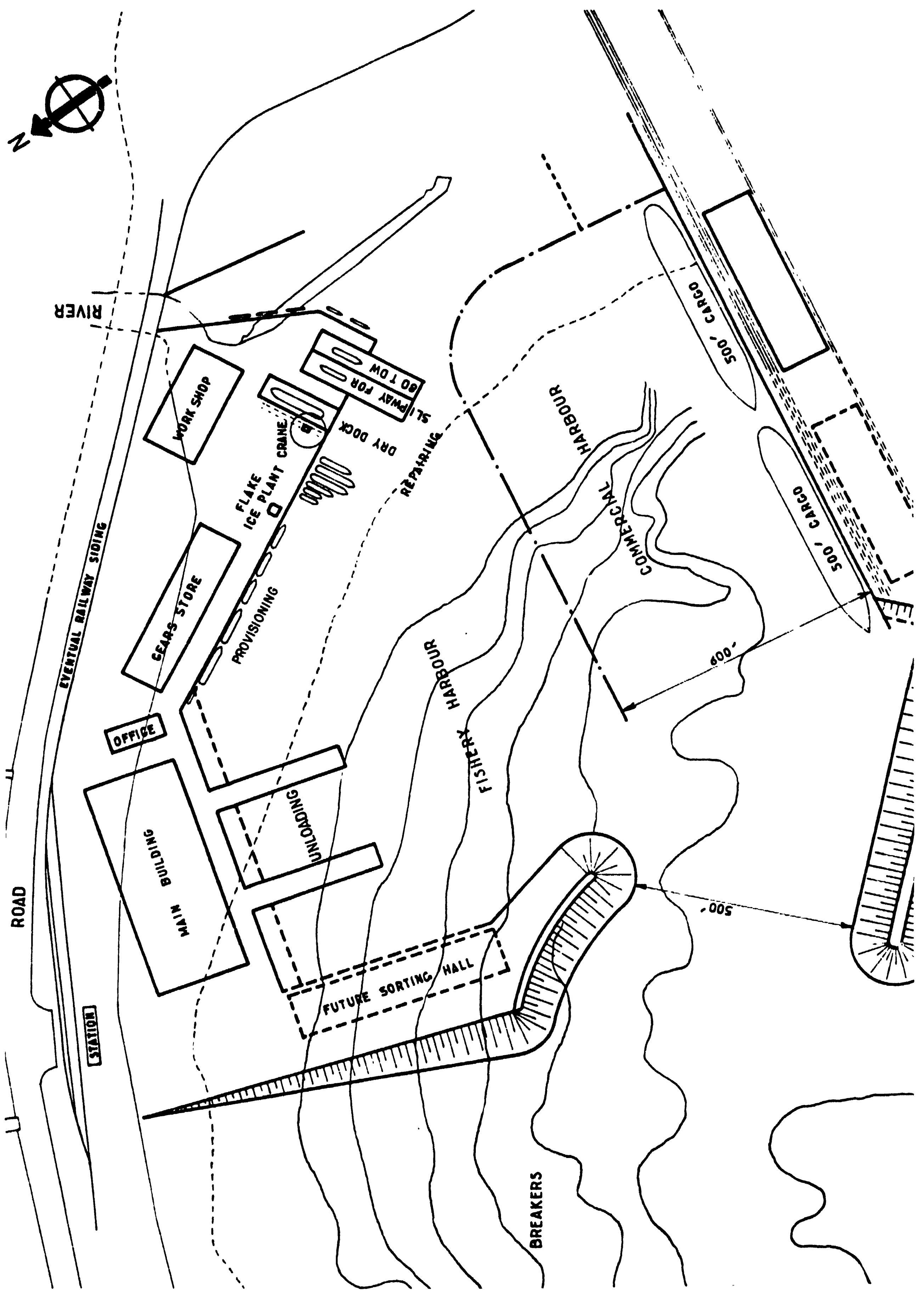


Fig. 4. Alternative D Promopeche Citra

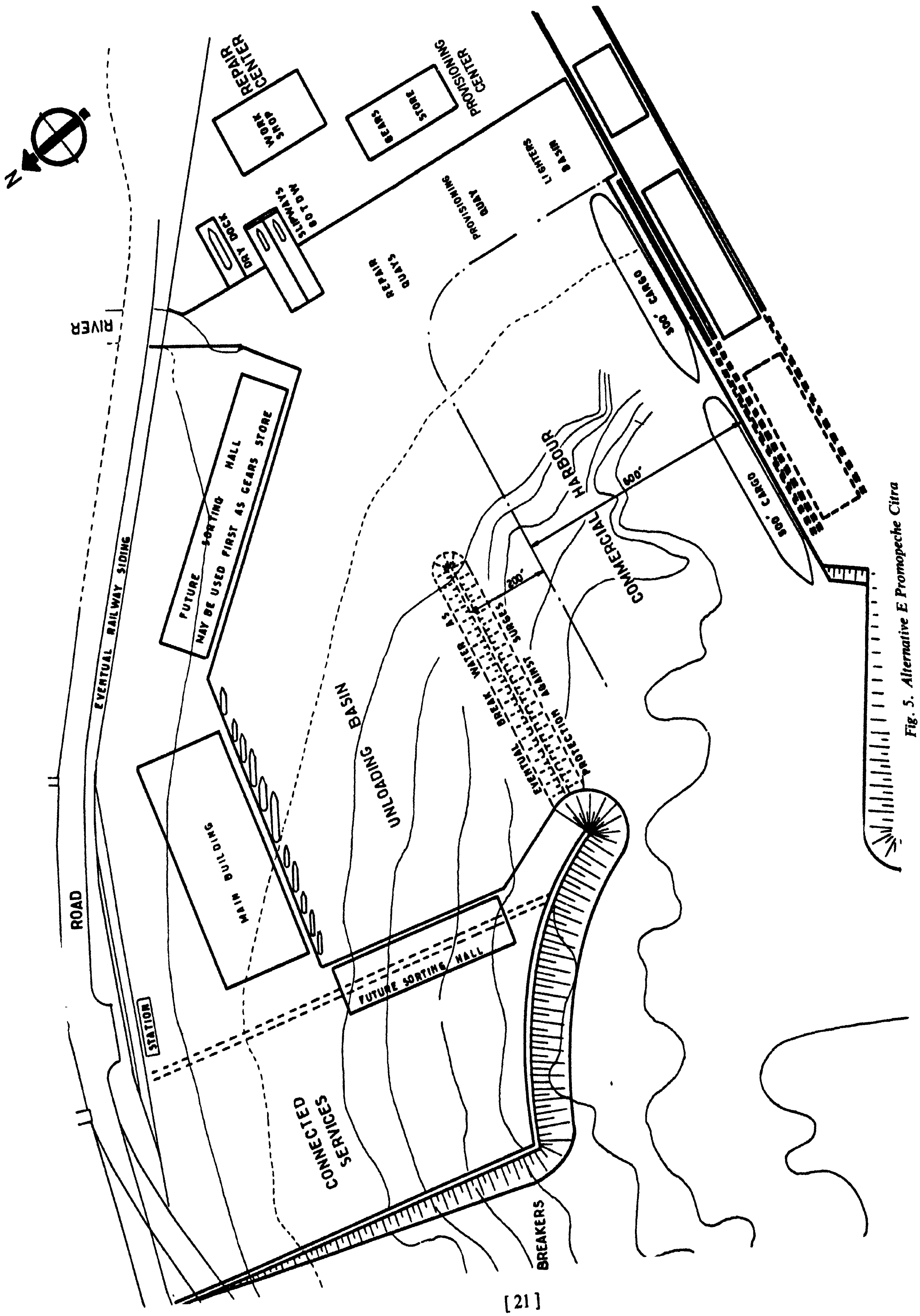


Fig. 5. Alternative E Promopeche Citra

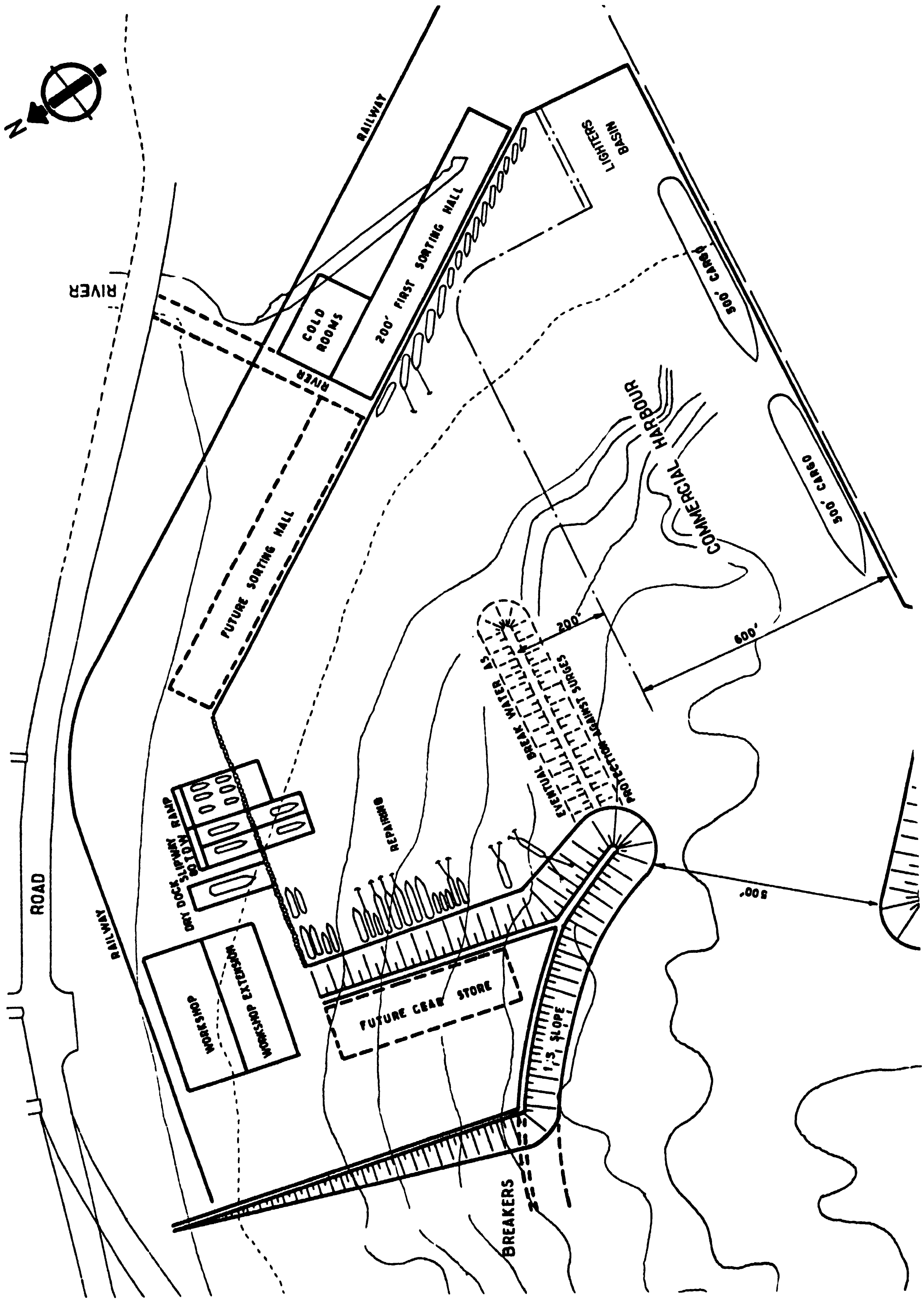


Fig. 6. Alternative F Promopeche Citra

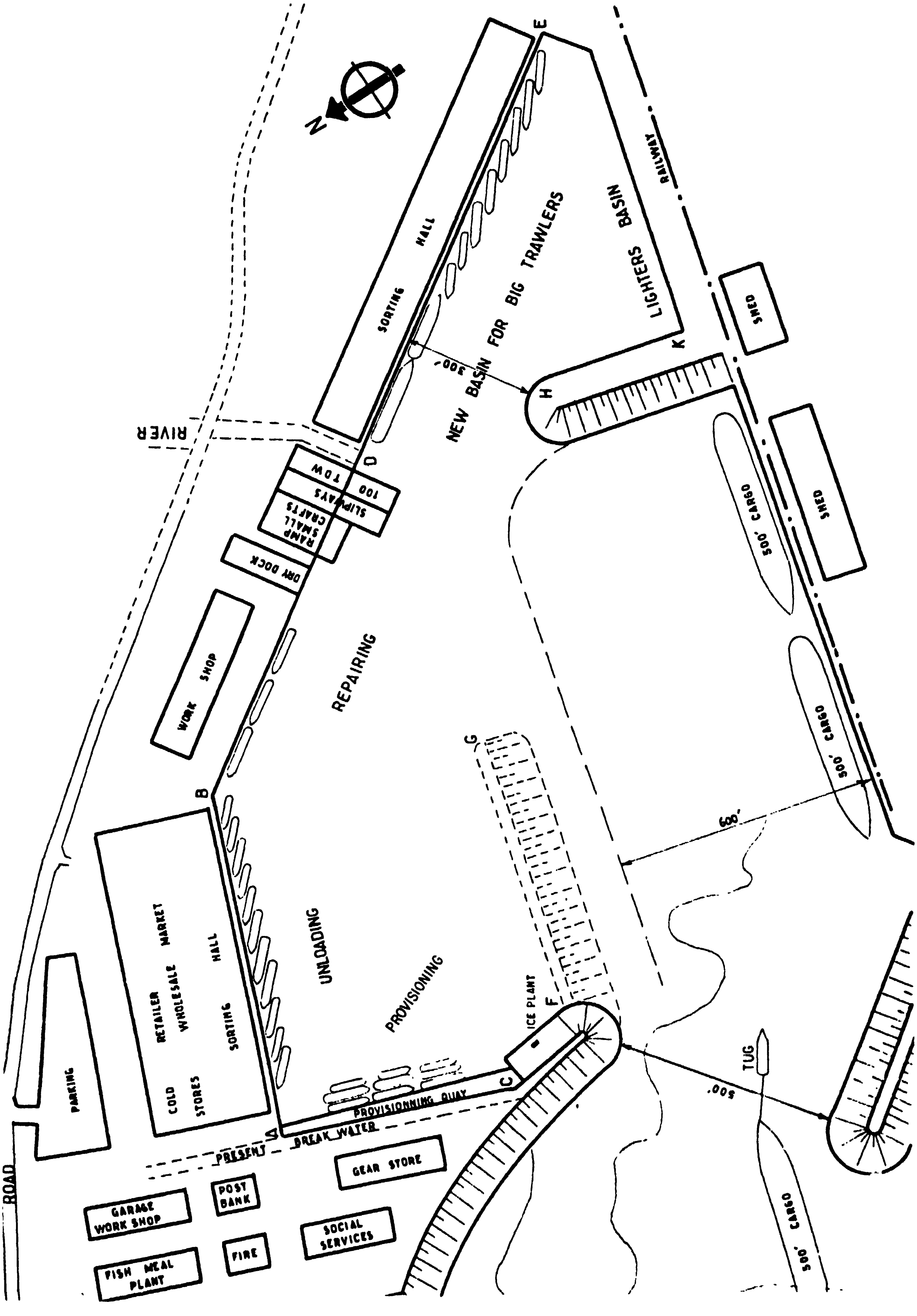


Fig. 7. Alternative H Promopeche Citra

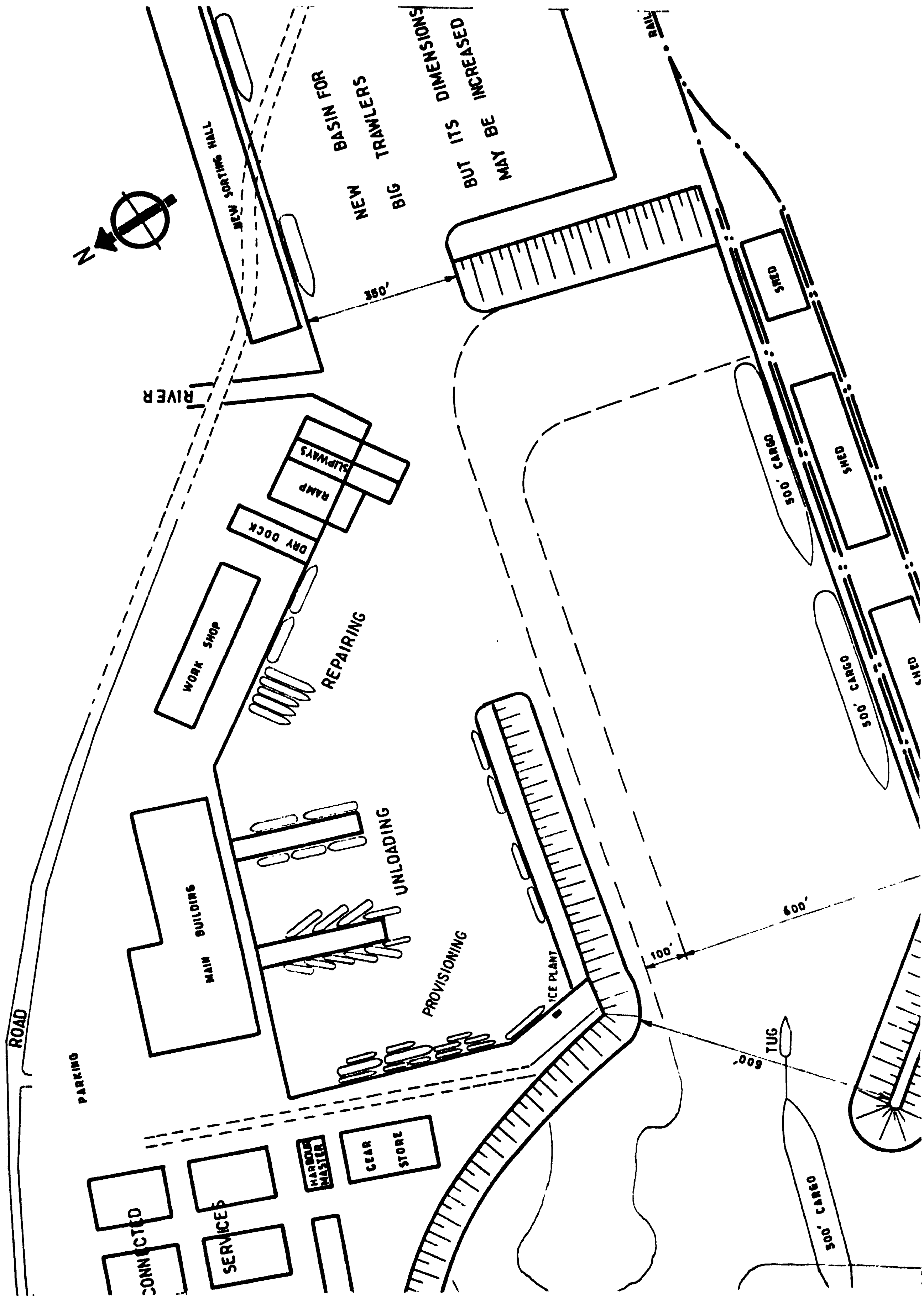


Fig. 8. Alternative I Promopeche Citra

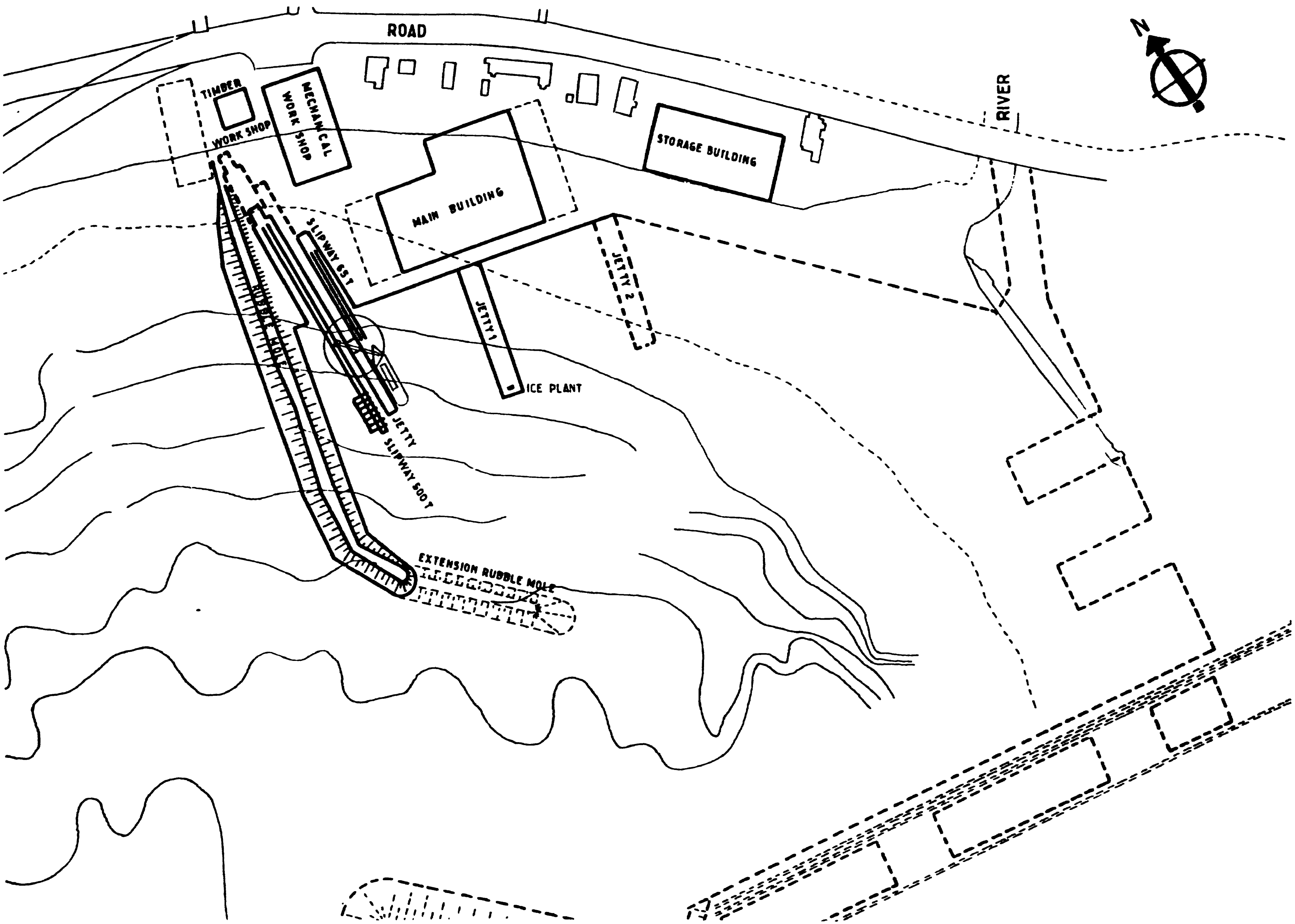


Fig. 9. *Project adopted by the Administration*

2ème Partie

NOUS avons indiqué dans la première partie qu'un des soucis majeurs d'un ingénieur chargé d'établir les premiers plans d'un nouveau port de pêche devait être de prévoir les possibilités d'extension future de ce dernier. Nous croyons intéressant de citer un cas récent d'application de ce souci.

LES PROPOSITIONS

PROMOPECHE avec la collaboration de CITRA, Société spécialisée dans les installations portuaires, a obtenu l'adjudication d'un port de pêche pour lequel le maître d'oeuvre prévoyait le développement ci-après.

(a) dans une première phase: débarquement de 30 à 50.000 tonnes de poisson soit en frais, soit en congelé pour un tonnage de navires de 10.000 tonnes environ;
(b) dans une phase ultérieure: débarquement de 90.000 tonnes de poissons pour un tonnage de de navires de 18.000 tonnes environ.

Le plan d'ensemble du port était imposé, un brise-lame déjà construit et des quais en cours de construction.

Ce port dispose de:

165 m (544 ft) de quai dragué à 10 ft (3 m)
350 m (1155 ft) de pier dragué à 20 ft (6 m)
5 hectares (12.5 acres) de surface à terre
7 hectares (17.3 acres) de plan d'eau.

Les rendements par mètre linéaire utile de quais indiqués au Congrès de Stockholm étant de 120 T par mètre dans les grands ports et de 60 T dans les petits, il était évident que dans la première phase ce port ne pourrait absorber que 30.000 T de poissons: ce qui était juste suffisant. Ceci d'autant plus que le slipway tel qu'il était prévu devait diminuer la longueur des quais disponibles et encombrer le plan d'eau déjà assez réduit. Déjà insuffisant pour atteindre les buts de la première phase, le port ne pouvait permettre de réaliser la seconde phase sans agrandissement.

PROMOPECHE et CITRA out alors procédé à une étude comparative des caractéristiques des ports de pêche dont la production correspondait aux exigences de la dernière phase. Il a été tenu compte de certains facteurs de correction dans l'appréciation des conclusions tirées de cette étude.

(a) Certains pays, très industrialisés et ayant une grande expérience de la pêche, peuvent investir des sommes importantes en prévision d'un développement dans un avenir lointain. Leurs ports peuvent être surdimensionnés quant aux besoins présents.
(b) Pour certains ports, détruits pendant la guerre, reconstruits depuis, des conditions de prestige peuvent même avoir joué et conduit à des installations plus importantes.

Bien que n'ayant aucun rôle de conseiller mais soucieux de prêter au maître de l'oeuvre nos services de spécialiste, nous avons alors présenté des plans de développement futur, respectant le plan initial, mais montrant qu'il permet dans l'avenir des extensions importantes des quais et terre-pleins, ainsi que l'accès et l'accostage d'unités plus importantes que celles prévues.

Les conditions locales

Deux conditions locales peuvent faciliter ce développement:

Le port de pêche est compris dans un judicieux ensemble comportant un port de commerce avec deux postes d'accostage pour cargos de 10.000 T. On peut ainsi prévoir que le port de pêche pourra déborder un jour sur le port de commerce et y utiliser des surfaces actuellement disponibles et qui dans l'avenir seront très difficilement utilisables par ce dernier. La géologie montre que les terrains limitant le port sont de formation très récente et facilement dragables, ce qui permettrait un jour de creuser aisément un nouveau bassin pour des unités de fort tonnage et même pour l'extension du port de commerce actuel limité à 2 postes pour cargos de 10.000 T.

Des dragages importants sont nécessaires pour porter les deux ports de commerce et de pêche aux profondeurs voulues. Les produits dragués sont constitués par un sable convenant parfaitement pour les remblais. Ils pourront être utilisés pour remblayer de vastes surfaces à l'ouest du brise-lames du port de pêche, qui seraient utilisées quand le besoin se fera sentir pour des magasins divers, oeuvres sociales, logements et industries annexes.

VARIANTES PROPOSEES

Il s'agissait du premier port moderne de pêche à construire dans le pays qui ne connaît guère qu'une pêche artisanale. De ce fait, une lourde incertitude régnait quant aux bases devant permettre de définir avec précision les caractères de ce futur grand port de pêche. Sous cette réserve, nous considérions que les longueurs de quai pour déchargement, ravitaillement et réparation ainsi que les surfaces d'eau et à terre, risquaient d'être insuffisantes. Conscients comme dit plus haut, des obligations morales découlant de la confiance qui nous était faite en tant que constructeur, nous avons étudié quelles modifications et extensions pourraient être apportées pour permettre d'atteindre quand même le considérable tonnage de 90.000 T prévu pour la dernière phase. Les plans joints montrent quelles modifications peuvent être apportées ultérieurement au plan adopté par l'administration locale.

Nous avons recommandé d'augmenter les surfaces disponibles à terre. Ce résultat peut être obtenu de deux façons:

(a) Par remblaiement de la côte à l'ouest du brise-lames du port de pêche. Ce résultat peut être obtenu à bas prix par pompage des résidus dragués dans le port de commerce et le port de pêche. Il est à noter que le sable apporté par l'érosion contre le brise-lames réduira le volume de cet apport de produits de dragage. La surface ainsi gagnée sur la mer sera des plus utile pour l'installation d'activités interessées par l'industrie de la pêche.

Le remblaiement devra être limité au sud, de façon à ne pas gêner les manoeuvres d'entrée ou de sortie du port de commerce pendant la période des vents dominants alors que des brisants dangereux se forment le long de la plage nord. Ce but peut être atteint par un tracé bien étudié, au besoin en laboratoire, et un profilé en pente douce (1/5) absorbant l'énergie des brisants et évitant les réflexions.

(b) Pendant la construction du port de commerce, s'est produit un important ensablement de l'est de la zone prévue pour le port de pêche (avancée de 150 m (492 ft) environ). Dans ces conditions il existe une surface importante gagnée sur la mer qui pourrait être utilisée par exemple comme zone de réparation avec slipways, rampe pour petits navires, ateliers et quais de réparations, mais d'un autre côté, il semble correct de ne draguer qu'une partie de cette zone. Il faut donc réaliser un compromis: gagner sur la mer de nouveaux terrains tout en évitant de réduire le plan d'eau déjà trop petit.

Les quais

Nous avons recommandé également d'envisager dans le futur la construction de deux quais:

(a) le quai de ravitaillement, qui pourrait être réalisé le long du côté Est du brise-lames du port de pêche;

(b) le quai de réparations à l'est du port.

Avec les vents dominants il y a des vagues de très longues amplitudes et périodes. Elles peuvent donner lieu à des seiches en raison de résonances dues aux réflexions de la houle sur les quais du port de pêche. Pour éviter ce phénomène deux solutions peuvent être adoptées:

(i) construire, non des quais à face verticale pleine qui réfléchissent la houle, mais tels autres types qui réduisent ce phénomène;

(ii) prolonger vers l'est le brise-lames du port de pêche jusqu'à quelques mètres de la zone du port de commerce draguée à 30 ft (9 m), ce qui réduirait suffisamment l'entrée du port de pêche.

La possibilité d'augmenter considérablement la zone réservée aux installations à terre et de tripler les longueurs de quai conduit à plusieurs possibilités conformes aux prévisions du plan de développement.

VARIANTE A

Elle présente les principales caractéristiques suivantes:

(a) La position du bâtiment principal reste le long du quai nord.

(b) Le côté intérieur du brise-lames sera utilisé par les navires à ravitailler ou en instance de départ. Les postes d'amarrage étant constitutés par des ducs d'albes, les fonds étant dragués à 20 ft (6 m).

Les magasins de matériels et de vivres ainsi que les ateliers divers (réparations de filets, d'apparaux de pêche, etc.) seront installés sur le terre-plein remblayé à l'ouest du brise-lames.

Une usine glace en paillettes pourra être construite à l'extrémité du brise-lames afin de ne pas interférer avec les opérations de déchargement et de ravitaillement des navires.

(c) L'est du port de pêche sera destiné aux installations de réparations. Afin d'éviter le danger que présente pour les navires la partie submergée du slipway, ce dernier doit être installé le plus au sud possible du quai des réparations.

(d) Il est évident que le quai des réparations ne sera pas protégé contre la houle. C'est pourquoi il est nécessaire de prévoir une jetée au sud du port, orientée est-ouest pour ne pas mordre sur la zone du port de commerce draguée à 30 ft (9 m). Dans une phase ultérieure cette jetée pourrait être aménagée pour l'amarrage des navires en réparations.

Ce brise-lames évitera toute agitation sur le plan d'eau, il sera possible d'amarrer les navires en cours de déchargement obliquement au quai, augmentant ainsi les possibilités de déchargement.

Le prix de cette jetée serait relativement faible. Construit dans des fonds de 20 ft (6 m), d'un profil léger en raison de sa situation abritée, d'une longueur de 200 ft (60 m) il serait constitué par un volume de pierres en vrac d'environ 25.000 cubic yards (32,700 m^3).

Variante B

Elle diffère de la variante A par l'adoption d'une cale sèche au lieu d'un slipway. Certes, le prix d'une cale sèche est plus élevé, mais en raison de la nature du terrain cette augmentation pourra être réduite. En supprimant ainsi la partie sous-marine du slipway la surface du plan d'eau utilisable serait augmentée.

Variante C

Le complexe des réparations serait installé dans le port de commerce, mais en dehors de la zone réservée aux cargos, et dans une partie abritée. Le port de pêche pourrait être agrandi dans de fortes proportions et sans aucun doute, pourrait absorber un trafic de 100.000 tonnes/an et abriter l'importante flotte de pêche prévue.

Variante D

Cette variante est caractérisée par la suppression des deux piers prévus permettant aux navires d'accoster directement en face du bâtiment principal: condition idéale pour la manutention du poisson. Le risque de réflexion de la houle dans le port peut-être éliminé en construisant des quais sur pieux (cf. variantes proposées: 3.2(i)) et en prolongeant vers l'Est le brise-lames à une distance de 200 ft (60 m) des fonds de 30 ft (9 m), afin de ne pas gêner la manoeuvre des cargos dans le port de commerce.

Variantes E et F

Voir plans.

Variantes H et I

L'emplacement du port de pêche en question a été admirablement choisi par l'Administration locale, tant en vue de l'économie à court terme du pays que par sa situation exceptionnelle qui peut y amener un développement considérable d'industries de pêche même d'un caractère international. Nous nous sommes souciés de vérifier s'il pourrait un jour se prêter aux agrandissements considérables que nécessiterait un tel développement.

Une étude géologique de la région, certes relativement limitée, nous a montré qu'il s'agit d'une vaste zone d'atterissements très récents, qui permettraient le dragage d'un futur vaste bassin avec utilisation des produits de dragage pour créer de nouvelles zones pour l'installation d'industries et services connexes. Nous avons ainsi abouti aux variantes H et I qui ne peuvent être évidemment que très schématiques. Il est assez curieux de noter qu'elles permettraient en même temps de donner plus d'aise au port de commerce.

Aspectos a Considerar en la Planificación y Administración de Puertos y Mercados Terminales Pesqueros

por J. L. González-López

Aspects to be considered in the planning and on the administration of fishing ports and port markets

The paper refers to the factors to be considered before deciding on the location of a fishing port or a port market, and on the type and size of the corresponding installations and services. Reference is made also to aspects of the administration of such ports and markets and to the systems of sales at such ports.

Elements a prendre en consideration pour la planification et l'administration des ports de pêche et marchés portuaires

Sont exposés les facteurs dont il faut tenir compte dans le choix de l'emplacement d'un port et centre de pêche et ceux qu'il faut étudier pour fixer le type et l'importance des installations et services requis. L'auteur traite également divers aspects de l'administration des ports et marchés de cette catégorie, ainsi que l'organisation de la vente des produits de la pêche.

CUANDO se proyecta un puerto y un mercado terminal de venta de pescado al por mayor, debe estudiarse cuidadosamente y de modo principal su localización, teniendo en cuenta los siguientes aspectos:

(a) Factores geográficos y físicos, estudiando circunstancias como: abrigo, profundidad del agua, disponibilidad de espacio, mareas, dirección y fuerza del viento, obstrucción por lodo, fango y barras de arena, corrientes marinas.
(b) Factores económicos: áreas de pesca cercanas o alejadas, tiempo de navegación para llegar a ellas, tiempo de pesca.
(c) Embarcaciones: clase número, radio de acción, capacidad.
(d) Volumen de los desembarques y posible evolución futura.
(e) Elementos para reparar y equipar barcos.
(f) Zonas de comercialización: posibles zonas de mercado, magnitud de la demanda, distribución de productos frescos o elaborados, mercados próximos, intermedios o distantes, medios de transporte, minoristas.
(g) Disponibilidad de terreno: desarrollo futuro de la industria pesquera, estímulo del puerto y el mercado sobre el número de embarcaciones y los desembarques, espacio para futuras ampliaciones.

TIPO Y TAMAÑO DE LAS INSTALACIONES Y SERVICIOS

Una vez seleccionado el lugar, el siguiente problema es el tipo y tamaño de instalaciones y servicios necesarios, debiendo tenerse en cuenta los siguientes factores:

(a) Tipo y número de barcos y desembarques esperados: Capacidad de desembarques, tipos de equipos necesarios (muelles, locales de venta y expedición, fábricas de hielo, cámaras frigoríficas, fábricas de elaboración, suministros de combustible y agua, pertrechos, talleres de reparaciones), desembarques esperados por año, por temporada y por día, necesidades actuales y posible desarrollo futuro.
(b) Llegadas por tierra: pescado de agua dulce y transportado por tierra de otros lugares.
(c) Especies de pesca y forma de utilización. Los tipos de instalaciones y servicios dependen de las especies de pescado que llegan al mercado, así como de las clases de productos que se envían desde él (fresco, congelado, filetes, enlatado, secado, salado, ahumado, etc.).
(d) Métodos de venta y usuarios. El método normal de venta al por mayor en los mercados pesqueros es la subasta. El tamaño de las salas de subasta dependerá del volumen de los desembarques y del número de compradores que se espera tomen parte en la subasta. Si el pescado se va a vender a precio fijo o se entregará a determinados compradores o elaboradores, no habrá necesidad de salas de subasta. Si el pescado se vende a mayoristas y ellos venden a minoristas en los locales del mercado, además de las salas de subasta harán falta más espacio y más locales, no sólo para uso de mayoristas, sino también para que los minoristas almacenen en ellos el pescado adquirido, hasta darle salida.

DISPOSICION GENERAL Y ELEMENTOS

(a) Muelles de desembarque. Convendrá que la sala de subasta esté lo más cerca posible del muelle de desembarque, dejando espacio para la descarga, transporte interno, clasificación, peso y otras operaciones.
(b) Descarga. Se puede realizar a mano o valiéndose de equipo mecánico.
(c) Instalaciones para clasificar y pesar: cajas, etiquetas para indicar el nombre del propietario, mesas para clasificar por especies y tamaños, básculas para pesar.

(d) Sala de subastas. Espacio suficiente para exponer el pescado, con el fin de que lo puedan inspeccionar los compradores, si es que la venta se efectuara por el sistema de subasta.

(e) Locales para comerciantes. Pueden consistir en oficinas para los comerciantes e instalaciones y servicios como lugares para envasar y preparar el pescado y almacenes para conservarlo.

(f) Fábricas de hielo y cámaras frigoríficas. Su capacidad variará según el volumen de los desembarques y el modo de utilización del pescado.

(g) Instalaciones y servicios de elaboración. Pueden estar situados en el propio recinto del mercado o en sus inmediaciones. Estas instalaciones y servicios son, por ejemplo, congelación, fábricas de filetear, salazón, ahumado, enlatado, harina, aceite, etc. En la mayoría de los casos son empresan privadas las que poseen y dirigen estas instalaciones y servicios.

(h) Transporte. El transporte interno puede ser manual o mediante vagonetas, carros, carretillas, coches eléctricos, cintas transportadoras, etc. El externo se hace principalmente por carretera o ferrocarril. La disponibilidad de instalaciones y servicios de transporte externo depende en gran parte del estado general de las comunicaciones y de los medios de transporte existentes en cada país. Por lo general, son los compradores quienes se encargan de la expedición de su pescado.

(i) Envases. Hay gran variedad de envases para el pescado, como cajas de madera, de plástico, de aluminio, cestos de caña, etc., según clases de pescado y usos a que se destina. Se procurará su facilidad de exhibición, transporte interno e higiene.

(j) Combustible y otros suministros y servicios. El combustible puede ser suministrado por estaciones explotadas por el puerto o por empresas privadas situadas en el muelle o en la zona del puerto. Otros suministros y servicios incluyen tiendas de efectos navales, artes de pesca, carpinteros, herreros, talleres de reparación y varaderos.

(k) Agua y energía eléctrica. Es necesario disponer de agua para limpiar los locales del mercado, el pescado y los barcos, para beber y utilizar en las distintas fábricas, como las de hielo, y en las instalaciones de refrigeración y elaboración. Para la limpieza, con frecuencia se usa agua de mar. A veces es necesario perforar pozos para disponer de agua en abundancia. También es necesario disponer de energía eléctrica para el alumbrado y las fábricas de elaboración.

ADMINISTRACION Y ORGANIZACION

Aunque hay muchas maneras de dirigir, administrar y organizar los mercados de venta de pescado al por mayor en las terminales pesqueras, sin embargo, casi sin excepción, el puerto y las instalaciones y servicios portuarios son construidos y administrados por el Estado o los gobiernos locales o por algún otro organismo público. En algunos casos, dichos mercados están bajo la dirección de cooperativas de pescadores o de corporaciones privadas.

(a) Dirección y responsabilidades. Las terminales pesqueras, y quizá en mayor medida los mercados de venta de pescado al por mayor, constituyen un capital de la sociedad, cuya función es servir al interés común del desarrollo económico. Tales instalaciones de interés público por lo general no benefician directamente al empresario, pero hacen falta como base del desarrollo económico y del bien general. A esto se debe que sean las autoridades públicas quienes se encargan, por lo general, de construir y dirigir las terminales pesqueras y los mercados de venta al por mayor. Normalmente, los bienes raíces situados en la zona del puerto y las instalaciones y servicios primarios de los locales del mercado, como son las instalaciones y servicios de desembarque y las salas de subastas, los proporciona el Estado o los organismos que administran los mercados de venta de pescado al por mayor. Algunas instalaciones y servicios como las fábricas de hielo, depósitos frigoríficos, instalaciones de elaboración, suministros de combustible, etc., los proporcionan las industrias privadas mediante contrato con la entidad administradora del mercado. La variedad de formas de dirigir y administrar estos mercados hace imposible toda generalización, y por esto se debe tener cuidado desde el primer momento de planear las responsabilidades del Estado, de los organismos públicos y de las empresas privadas.

(b) Finanzas. Cuando las instalaciones y los servicios se proyectan por el Estado u otros organismos públicos, los costos de capital de la construcción inicial son generalmente financiados por el Estado, mientras que los gastos de conservación y funcionamiento corren a cargo de las entidades administradoras del mercado o del puerto, con los ingresos que obtienen por distintos servicios.

ORGANIZACION DE LAS VENTAS

(a) Métodos de venta. La subasta es un procedimiento de bastante aceptación. Sin embargo, en algunos puertos se vende a precios convenidos de antemano o al precio que se determina en cada caso según la oferta y demanda, o mediante trato individual entre vendedor y comprador.

(b) Subastadores. En la mayoría de los casos, las entidades administradoras del mercado proporcionan los subastadores.

(c) Orden de venta. La venta se hace generalmente de acuerdo con el orden de llegada de los desembarques, para que la pesca se despache lo más rápidamente posible, dando trato equitativo a los armadores y permitiendo que los compradores realicen sus adquisiciones de la forma más conveniente.

(d) Unidad de venta. La venta se puede efectuar por peso o por unidad o por cajas.

(e) Precio. En algunos puertos el precio lo fija el Estado, pero en otros los pescadores tienen derecho de establecer un precio mínimo de reserva o de retirar el pescado si no les satisface el precio más elevado ofrecido en la subasta. En algunos países hay un sistema de precios mínimos garantizados para ciertas especies de pescado, y el pescado que no se vende por encima del precio mínimo se envía a las fábricas de harina. Este procedimiento lo financian totalmente los armadores o entre los armadores y el Gobierno.

(f) Comisión por servicios de subasta. El tipo de comisión por el servicio de subasta varía considerablemente de un mercado a otro. Por lo general es un porcentaje sobre los ingresos.

(g) Liquidación de cuentas. Efectuada la subasta es preciso liquidar las cuentas entre pescadores y compradores, así como pagar los derechos al puerto y a las entidades administradoras del mercado. Por lo general, a los compradores se les concede algún crédito en sus pagos. En la mayoría de los casos, los compradores están inscritos en el registro del mercado, exigiéndoseles cierta cantidad como depósito, según la magnitud de las compras que se espera hagan. Los compradores adquieren el pescado con tal depósito, el cual tiene que ser repuesto constantemente, y con él se paga a los pescadores una vez terminada la subasta.

The Planning and Preparatory Work for a Fishery Harbour Development Project

by W. J. Guckian

Projet d'amenagement d'un port de pêche: planification et travaux preparatoires

L'auteur de la communication donne la définition d'un port de pêche et énumère les principales caractéristiques que devraient posséder des installations portuaires halieutiques ideales. Il décrit les méthodes recommandées pour l'établissement des avant-projets de construction et les études qui doivent aboutir à la réalisation du projet. Il mentionne un certain nombre de points dont il faut, selon lui, tenir spécialement compte dans la planification de ports de pêche.

La communication renferme des données sur les coûts et des indications destinées à aider les services des pêches dans l'élaboration des projets d'aménagement de ports de pêche et leur présentation à la Banque internationale pour la reconstruction et le développement (Banque mondiale), ou à l'une des banques régionales de développement, aux fins de financement international.

El diseño y la labor preparatoria de un proyecto de desarrollo de un puerto pesquero

En este estudio se trata de dar la definición de un puerto pesquero, indicándose las principales características del complejo ideal de puerto pesquero. Se describen los procedimientos recomendados para realizar el diseño y las investigaciones de ingeniería preliminares que conducen a la realización del proyecto. Se enumeran algunos puntos que, en opinión del autor, tienen importancia en el diseño de los puertos pesqueros.

Se dan orientaciones y datos sobre los costos con objeto de ayudar a los Departamentos de Pesca en la preparación de un proyecto de desarrollo de puertos pesqueros y en su presentación al Banco Internacional de Reconstrucción y Fomento (Banco Mundial) o a uno de los Bancos Regionales de Desarrollo para su financiación internacional.

WHAT is a Fishery Harbour? And how should the preparatory planning operations and the actual harbour construction programme be conducted?

The answers to these questions for most engineers with marine works experience are a fundamental part of their everyday work. Experience gained in a short period of service by the author as a Civil Engineer with FAO and in the FAO/IBRD Cooperative Programme indicates, however, that a widespread lack of familiarity with technical procedures exists in the Fishery Departments and their advisers in many developed and developing nations.

This paper has been prepared to assist them. It is hoped that it will clarify a number of points that planning engineers must consider, and present a few of the many problems to be resolved before a project can become fully operative.

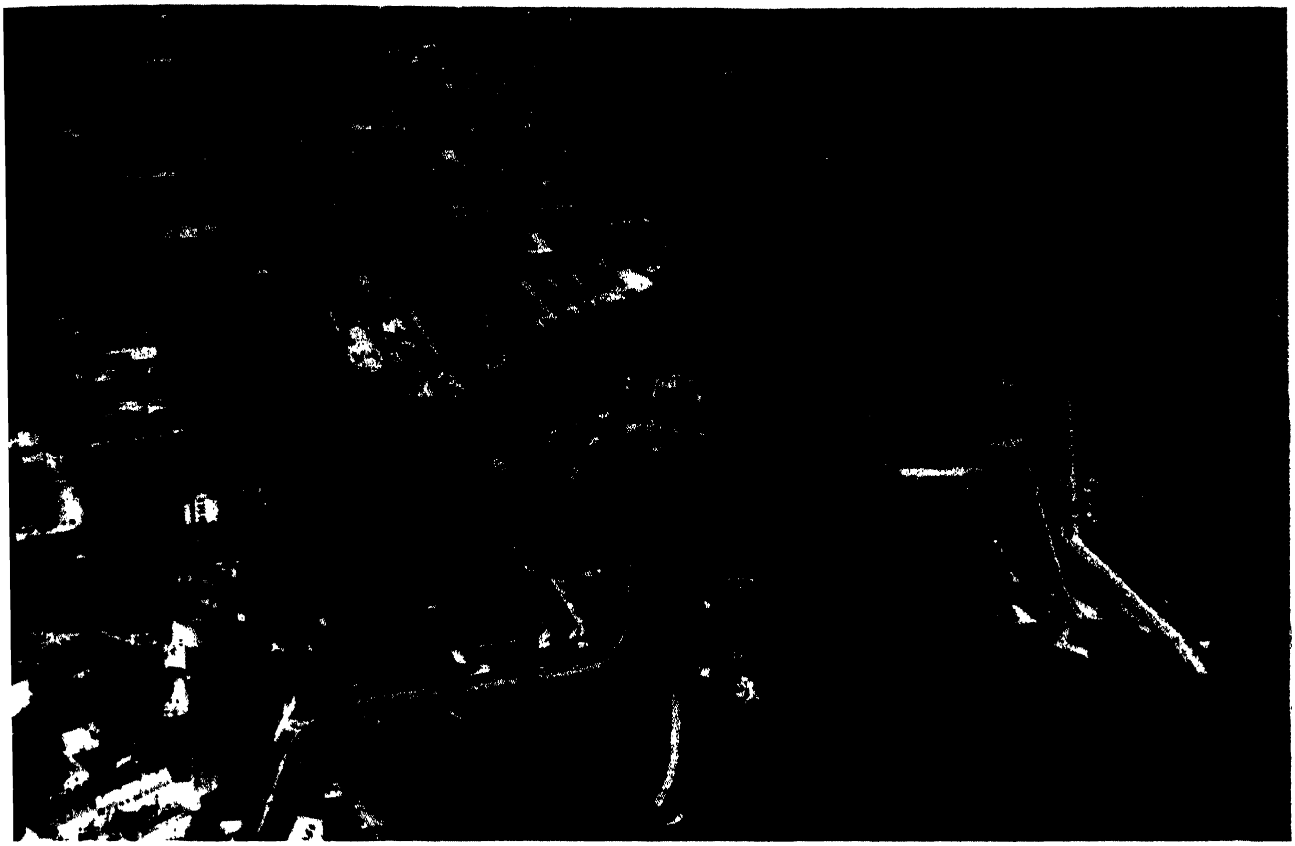
DEFINITION

First, some attempt must be made to provide a definition for the term "fishery harbour". Alonzo de F. Quin (1966) has written that a harbour ". . . is a water area partially enclosed and so protected from storms as to provide safe and suitable accommodation for vessels seeking refuge, supplies, refuelling, repairs or the transfer of cargo". Applying this to the fishing industry, a fishery harbour could cover any facility from the semi-protected beaches and coves for canoes and small boat landings seen so frequently in Asia and in Africa; the slipways and sloping piers of Western Ireland; the mechanically operated ropeway for surf landings off Jutland or the hand ropeway of the West African beaches; the small and ancient ports of the Mediterranean coastline; or the more sophisticated and large ports such as Esbjerg, Grimsby, Bremerhaven, Cuxhaven, Karachi or the projected major port at Manila. The term "fishery harbour" therefore has as many definitions as there are fishing centres throughout the world, since no two sites, as far as the author can determine, are alike or have the same natural or artificially provided characteristics, though each in its own way serves a basic need for the locally based fishery interests.

It will be necessary, therefore, to write in terms of an *ideal fishery harbour* to give point to many observations. What characteristics then should an ideal fishery harbour possess if we are to provide a standard for comparison of the qualities of the various locations and situations that might be under examination. Figure 5 illustrates some of the activities to be catered for in the ideal harbour.

The following are a few of the characteristics that should be present in the ideal fishery harbour. Quantitatively they would vary from project to project depending on, for example, the number, length and draft of vessels, the types and quantities of fish landed, the methods of fishing and types of gear in use etc.:

(i) A safe and easily identified approach from the open sea with adequate depth at all tides.
(ii) A safe, well-defined entrance and approach channel of adequate depth at all tides.
(iii) A sufficiently large, deep and protected basin to cater at all tides for the operations required, e.g. turning and manoeuvring of vessels, anchorage of vessels awaiting landing space, permanent anchorage for vessels unable to use the berthing quays, servicing of dredgers and other maintenance vessels etc.



ig. 1a. *Fishery harbours take many shapes and sizes, from the major ports such as Bremerhaven in the Federal Republic of Germany, shown here, and the one shown in 1b to the minor "harbours" shown in 1c and 1d*

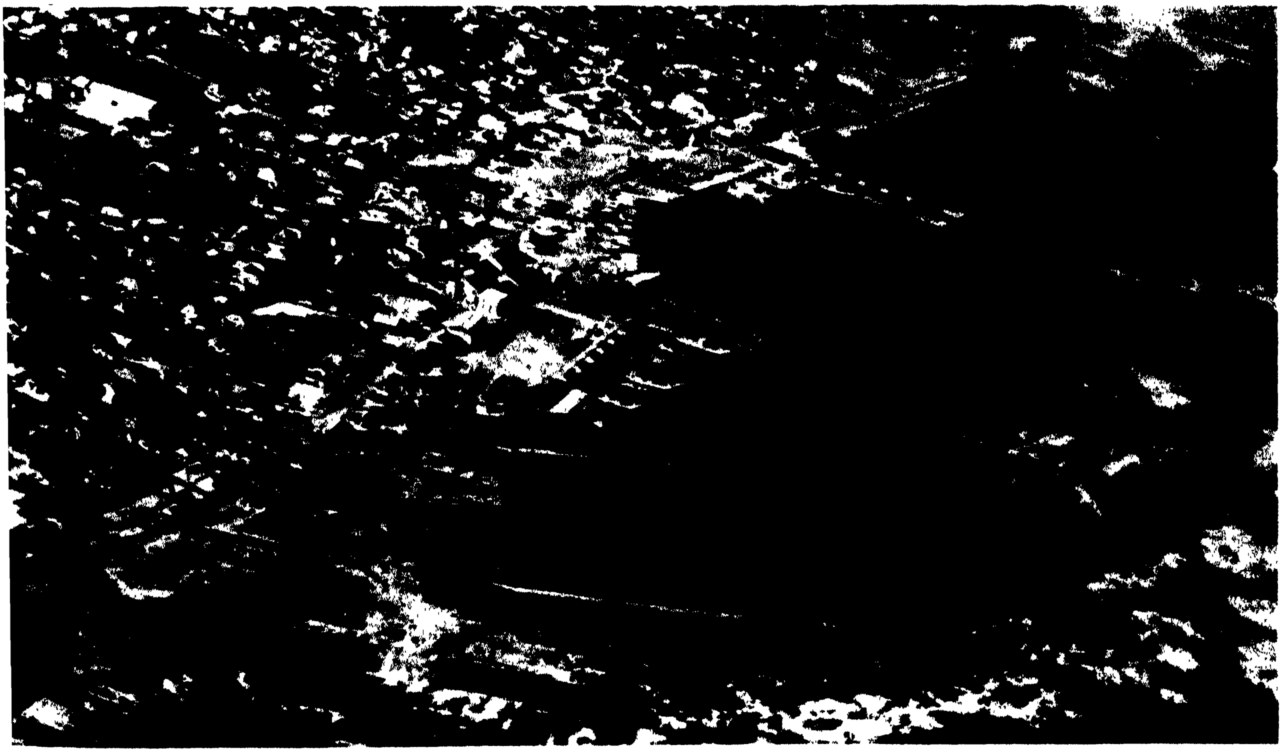


Fig. 1b. The fishery port of Chikura, Japan

Fig. 1c A boat "basin" in the Caribbean area

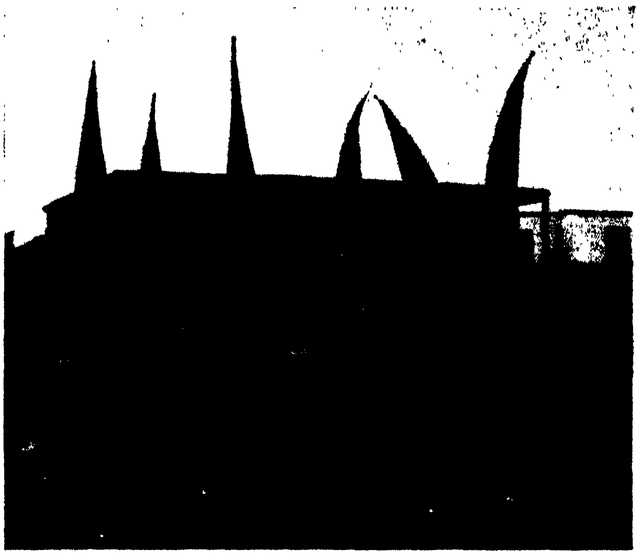


Fig. 1d. Reed canoes "at anchor" at Huanchaco, Peru

(iv) The provision of all necessary navigational beacons, visual and electronic aids to assist vessels in the safe use of the port.

(v) Where necessary, the provision of protective breakwaters of adequate structural design and suitable layout to reduce wave or storm effects within the approach channel and port facilities to acceptable limits.

(vi) Adequate landing, servicing and provisioning, berthing and repair quays or jetties to cater for the number and types of vessels using or likely to use the facility in the foreseeable future.

(vii) All necessary utility services, e.g. fuel oil loading points and storage, water (fresh and salt) services, ice-making plants and ice storage for supply of vessels and the shore-based activities, electricity supplies for public, industrial and domestic use, surface water drainage and sewerage systems, fire precaution services for vessel and shore use.

(viii) Buildings required for display, auction and sales; sorting; agents' and wholesalers' activities, harbour and fishery administration offices; storage accommodation for containers, gear and equipment; workshops and maintenance stores; training centres and laboratories (when required); wholesale and retail supply shops for all ships' supplies (where possible sited within the harbour complex); sheds or other buildings for net repair and vessel maintenance at the berthing quays, and stores for frequently recurring items, e.g. ropes, nets, fish boxes, lobster pots etc.; accommodation sheds for port transportation machines, e.g. forklift trucks, mobile cranes, tractors, wagons, etc.

(ix) Adequate space to be provided for the development of the necessary processing industries, freezing and cold storage facilities of the private and public sectors for the foreseeable future, where it can be made available by direct purchase or by the reclamation of dredged materials.

(x) Adequate main road connections to and from the harbour area and a well designed system of roads and/or railways to serve all activities within the harbour area.

(xi) Provision of parking space for industrial and private vehicles (not forgetting the ever-increasing tourist traffic), adequate space around halls and industries for loading and unloading vehicles without upsetting the free flow of through traffic.

(xii) Provision of vessel, engine, and gear repair facilities in the vicinity of the harbour, and the inclusion of boatbuilding establishments where the fleet is rapidly expanding or replacing its vessels from local resources.

See also Carl G. Bjuke's Reports (1960) and Jan-Olof Traung (1954).

INVESTIGATION ACTIVITIES

The planning activities before a final decision is taken are many and varied. They may basically be classified as:

Economic justifications, and
Engineer planning and investigations.

Let it be assumed that the former have been carried out or are being conducted in parallel with the later investigations. It must be noted, however, that the economic studies will include and lead to many other engineering and technical studies, while the latter engineering investigations will also call for several economical and other technical assessments relating to other than engineer activities.

Economic justifications

These will depend greatly on the status of the existing national fishery and relate to the known resources and landings. They might include:

- (i) Exploratory biological and other studies to assess the available fish resources in areas within the limits of the proposed fishery effort.
- (ii) The determination of the fishing methods to be used, the gear and equipment required, the numbers and types of vessel to permit a sustainable yield from the available resources.
- (iii) The study of the availability of personnel and/or training resources for crews, operatives, administrators to serve the proposed developments.
- (iv) There is a local interest in the project with adequate public and private capital for financing the necessary marketing arrangements, the ancillary industries, services and facilities on which a successful harbour development must depend.

Engineer planning and investigation

With the terms of reference resulting from the activities indicated, the engineer may also be given geographical limits for the location of the facility either for political or other reasons (e.g. state or provincial boundaries, etc.). These limits might be the length of shore line of a single bay or estuary, or, a stretch of coastline with many or few natural inlets and protective features, or, in the extreme, a specific location, perhaps adjacent to an existing small fishery facility, or within an existing commercial port.

It is to be hoped that in the latter circumstances the presence of a small and probably badly sited landing place providing, perhaps, for an entirely different fishery activity would not influence unduly the location of major works merely because the nucleus of an industry exists thereat. Works so circumscribed are frequently more costly and unsatisfactory with respect to later development rather than alternative more suitable virgin sites. Neither can the commercial port in the great majority of cases provide a suitable location for a new and modern fishery harbour.

SITE INVESTIGATIONS

The preparatory collection and study of existing records and available data would include:

- (i) **General documents,** e.g. large- and small-scale survey maps and marine charts of the area and the more probable locations; "Coast Pilot" or other similar navigation records of the adjacent water; tidal and surge records, if available, from existing nearby harbours (commercial or fishery); meteorological information, etc.
- (ii) **Special documents,** e.g. geological records, foundation investigation reports for structures (especially marine) in the area under study, dredging reports; existing water supply systems, electrical power supplies available, population densities, etc.

Study of these records will assist in the programming and priorities of the other investigations to follow.

Preliminary reconnaissance

The full length of the coast should be visited to assess general possibilities of each location. In such visits, marketing potential, transportation and storage possibilities, as well as general site characteristics, should be examined.

The planner, following such reconnaissance visits, can draw up lists of sites which, subject to more detailed investigation,

- (i) might be suitable in all or most respects for consideration;
- (ii) might be suitable in certain particulars but deficient in others;
- (iii) sites which would be unsuitable for the particular development envisaged (e.g. for reasons of excessive capital or maintenance costs).

Some amplification of existing survey information may be required at various sites (e.g. a line or two of soundings across a bay to prove water depths, or a few probes to confirm a rocky bottom) to confirm first impressions and produce an order of priority for further investigation.

Orders of cost for the schemes may be prepared as indicators only. Care must be taken in rejecting a site solely because of an excessive estimate based on incomplete data.

Further investigations

With the order of priorities determined extensive site work can proceed. Before a location can be accurately assessed it is essential that certain basic and accurate information be obtained. Such information would normally include a wide-ranging hydrographic survey covering all alternative layouts for any particular site. This is most satisfactorily conducted with survey type echo sounder equipments, assisted, if the area is sufficiently large, by some form of electronic position fixer. The survey should be tied to the local land survey stations and datum and extra large-scale details obtained where necessary to supplement the information available. For those not fully aware of the survey systems adopted, the *Admiralty Manual of Hydrographic Surveying* and other documents describe the various equipments and instruments and methods used in marine surveys.

When the survey plot is completed a rapid form of Soil Mechanics Investigation on a grid system of boreholes or investigation points to indicate the general nature of the subsoil should be conducted. (British CP 2001, Lackner (1966) and *Kompendium L. Geoteknik* refer.)

It must be remembered, however, that information is not required in great detail at this time. Several sites may have to be investigated in order that one or a small number be nominated for final selection. Time saved in investigations at this stage is essential, but not of course at the expense of accuracy.

The engineer, when this series of investigations has been completed, will have comprehensive, accurate and up-to-date information. He should prepare layout plans for any location which is shown to be satisfactory or

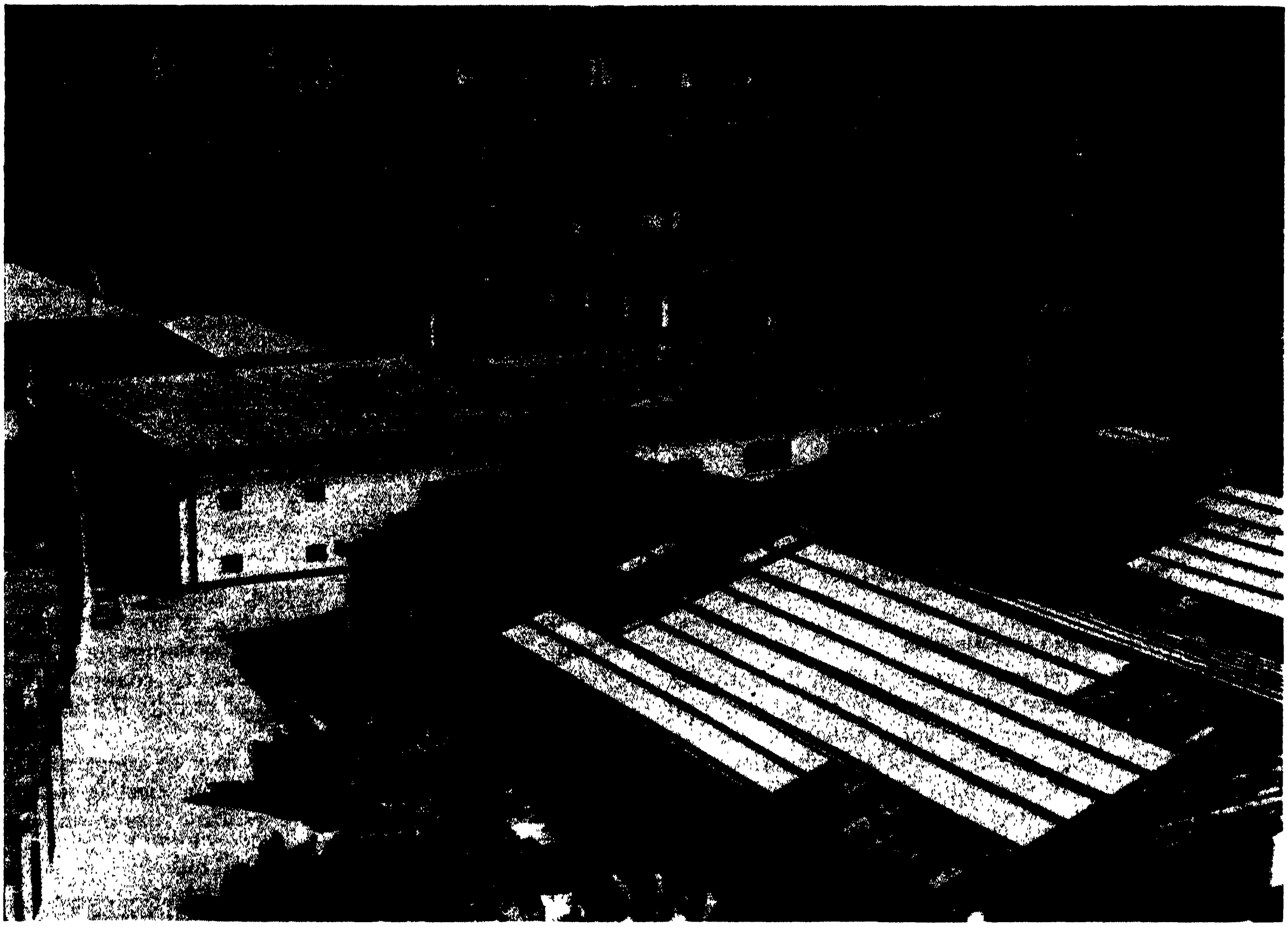


Fig. 2a. Marketing arrangements vary enormously, and range from the well-organized and sanitary methods of the modern facility shown here to the primitive conditions shown in 2b and 2c

Fig. 2b.

Fig. 2c.

suitable and, resulting from studies on the possibilities of these alternatives, choose a small number for further, more detailed, consideration. More accurate cost figures can be prepared to assist assessment of these locations. Before the short list of selected sites and their proposed layout plans is finalized, however, all other aspects of the project development must be examined. This will include liaison with the other fishery disciplines, the local government authorities, roadway, railway, water, sewerage and electrical services, oil companies, central and local development planners, etc. For an integrated harbour plan all such bodies and organizations will have an important share in the development and must be given an early opportunity to express their views and coordinate their own local planning.

After these investigations and discussions have been held there should be sufficient information to permit a final choice. It is desirable to have alternatives as there is still the possibility that an otherwise attractive site lacks certain necessary characteristics. An example of this might be finding unsuspected large quantities of underwater rock in an otherwise soft sea bed which would make development costs prohibitive, or, as has occurred in the author's experience in Ireland, the finding of an unsuspected area of very deep soft material which had more than tripled the original order of cost estimate for an otherwise satisfactory location.

Final detailed investigations

After final selection is made, much additional information will be required before a final scheme can be prepared. Much of this work will be costly and time consuming and should therefore be left until a positive recommendation for a location has been made and accepted by national authorities. A list of such investigations might include all or any of the following, supplemented by the information already obtained in the earlier less comprehensive examinations:

(i) Full and detailed topographical and hydrographical surveys, aided where necessary by photogrammetry, must be carried out and plotted to the largest possible scale. They must be of sufficient detail to enable accurate bills of quantity to be prepared for contract purposes and for the determination of land and property boundaries for the legal processes associated with their acquisition. They must show clearly all existing buildings, roadways and structures and, particularly in the actual area of the

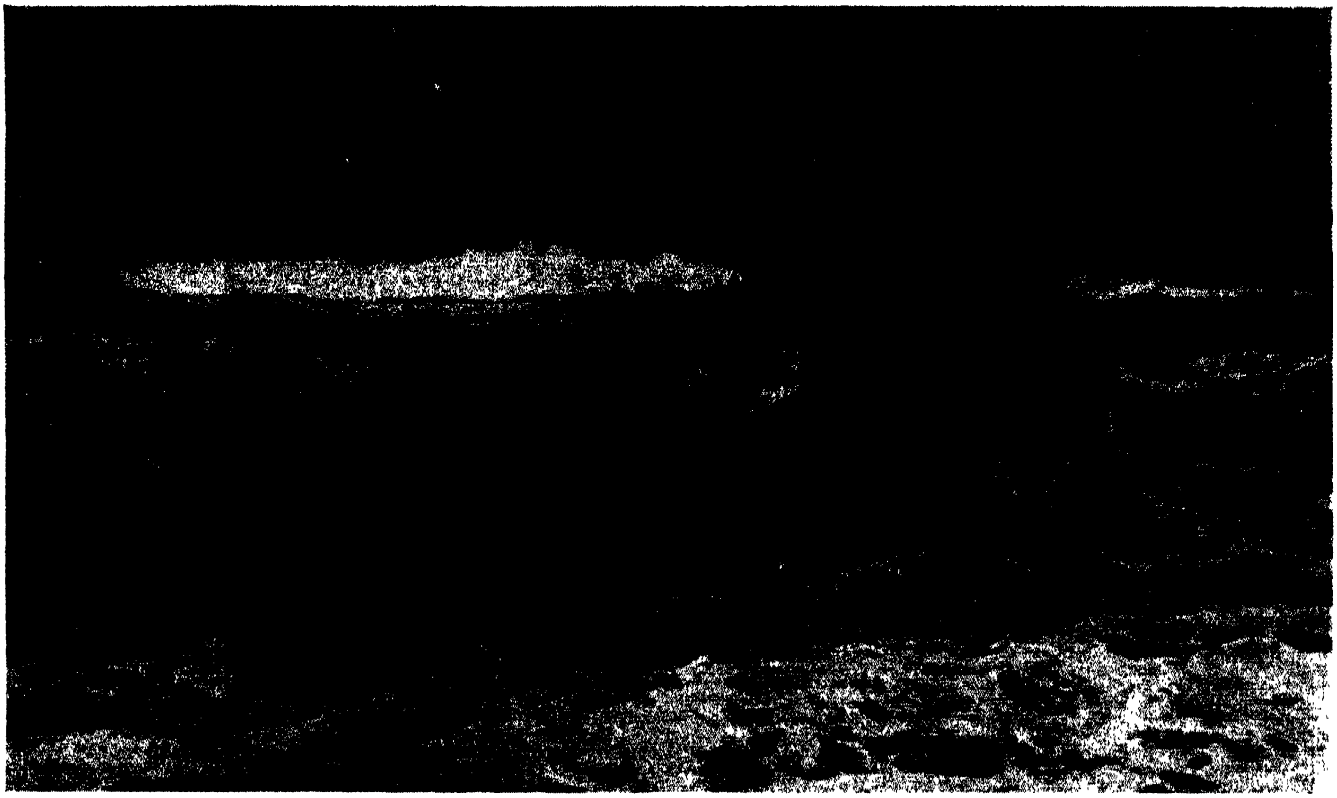


Fig. 3a.

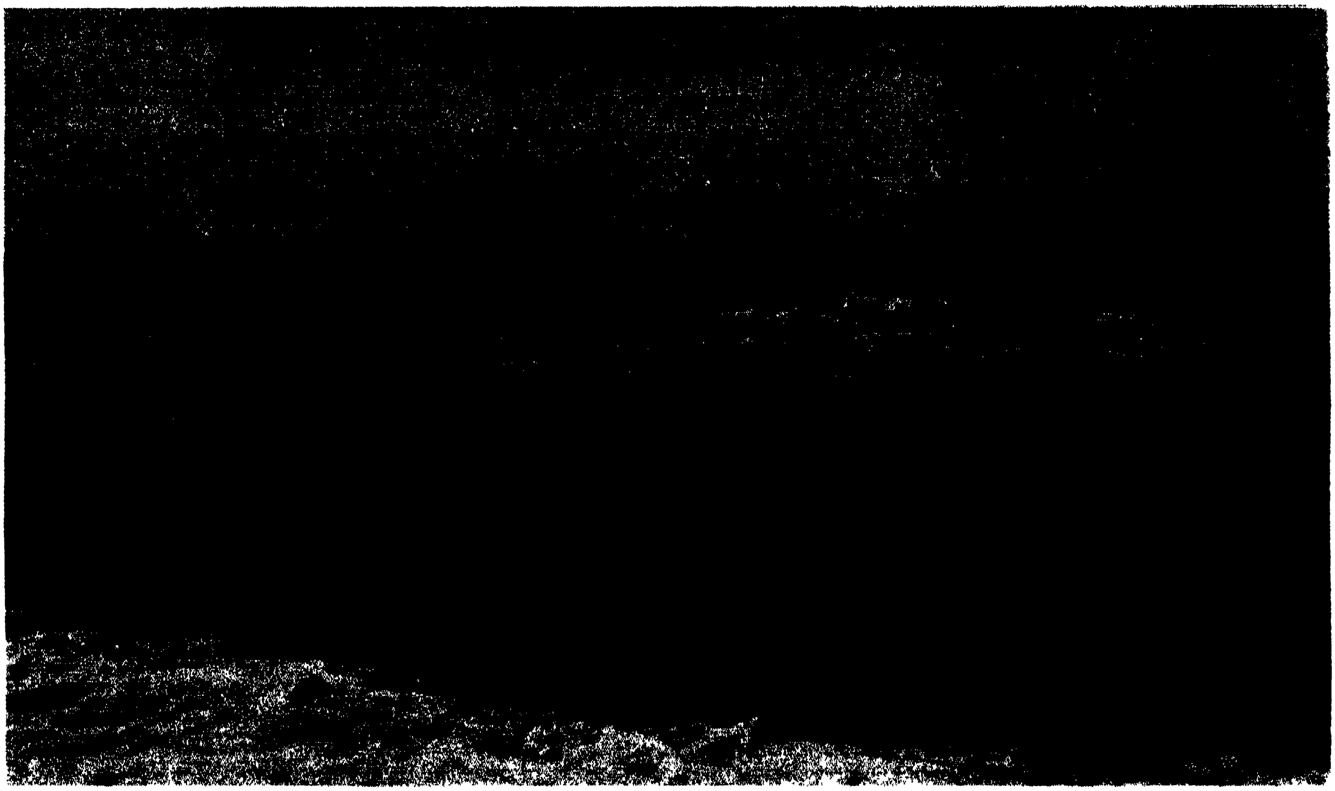


Fig. 3b.

Fig. 3a and b. Accidents such as these in Dahomey, West Africa, illustrate vividly the need for safe landings or harbours proposed project, all existing service details, e.g. electricity, water, sewerage, gas, land drainage, etc. The sea bed must be plotted accurately based on close soundings by echo sounder equipments. The lines should be more closely spaced at the proposed location of marine structures and in the areas where dredging may be required. By means of sweeping, the location of rock or other isolated obstruction must also be determined.

(ii) Information must be obtained on tidal movements and the low tide levels reduced from available tide gauge data to determine the depths required in the harbour basin and approaches to enable its full use at all tidal levels by the proposed fishing vessels. Assistance in the determination of these levels can be obtained from several sources, those available at the British Ministry of Agriculture and the Admiralty on Tide Gauge installation and operation and Harmonic Tidal Analysis (see references) are perhaps the most suitable.

(iii) The velocities, direction and depths of currents in the area under consideration should be studied to enable their effects on proposed works, and the changes caused by the works, to be studied.

(iv) Wave action, surges, seiches, etc. at the various parts of the proposed project, e.g. entrance, channel and basin must be examined. From this will be determined the necessity for breakwaters or other protective devices.

(v) The coastal regime, especially where fine beach sand or shingle exist, must be studied and an assessment made from existing information and further beach investigations. The effects of any proposed structure on the beach material and layout and the effect of the movement or drift of beach material on the structure are essential investigations in these circumstances.

From information gathered at (i), (ii), (iii), (iv) and (v), and at as early a stage as possible, a decision must be made as to the desirability of and/or the extent of hydraulic scale model tests in the proving of a project. Several papers presented at this Conference detail the reasons and justification for hydraulic model experiments. Such hydraulic scale models are the most accurate, simple and least costly method of studying the effects of changes to the coastal regime and the reduction of wave action caused by projected constructions. Very close agreement is now being obtained between the hydraulics laboratory scale model investigations and predictions and the full-scale prototype conditions. It must be pointed out, however, that hydraulic scale models will only be as accurate and comprehensive as the prototype survey and collection of data on which they are based. It may be necessary for instance to extend the collection of data for a drift examination over a full cycle to determine the full effect before any harbour study can commence. In many cases, as for instance, the monsoon region, the minimum cycle would be twelve months. The laboratory studies and associated experiments, even with the accelerated time factor present in the model, may extend over a period of between one and three years after the model has been proven for the accuracy of its reproduction. The fundamentals of hydraulic model investigation are available in many reference books, particularly those by Alonzo de F. Quin (1966), J. Allen (1954) and the papers and reports from the hydraulic laboratories and research establishments in many countries.

An example of the problems met with in respect of coastal drift can be seen by reference to Duvivier (1946), Elsewhere on the East Coast of India and along the coast of Togo, where approximately 1,000,000 to 2,000,000 tons of fine sand pass along each of these coasts per annum. Baskaran (1968) and C. R. Bjuke (1962) give some indication of the problems involved. The dredging or removal of such quantities of sands have imposed a tremendous burden on commercial harbour authorities even with their high revenues and other income. It is therefore very essential for the fishery harbour to attempt to avoid such hazards, or at least to reduce them to manageable proportions.

The best tool available to the engineer for the study of such problems at the present time is still the hydraulic mobile bed scale model.

(vi) Geotechnical investigations with, where necessary, the addition of geophysical investigations, should be conducted to cover the area of the proposed harbour layout. Figure 8 gives a typical borehole log as investigated under the British Standards Code of Practice CP 2001 (1957). It will be seen that to get a good indication of the subsoil layers a number of holes, preferably located on a grid system, will require investigation by geotechnical means. Alternative methods include investigation of a limited number of control boreholes investigated by normal geotechnical investigation and the remainder of the site investigation conducted with geophysical methods (acoustical, electric or electronic). This has some advantage in speed of operation but results obtained are generally unreliable and difficult to interpret accurately.

Of the various geotechnical methods available, that of the British Standards CP 2001, and the several other similar national systems, are probably the most accurate and produce the most reliable records. They are eminently suitable where time is not the essence of the development as, for example, when one location only is being investigated. To provide adequate results, i.e. say 50 boreholes over a moderately sized site in stiff clays on gravel, a period of up to 1½ years or even more may be required to complete the investigation with a single boring rig.

Alternative methods available include the Dutch and Swedish Sounding Systems coupled with controlled drilling in the Scandinavian system. While not so fully informative, the results from a large site with, say, 100 boreholes can be produced in two to three months. When controlled with a small number of soft and hard layer core holes extending the time to between three to three and a half months—the results are probably equivalent to the slower forms and are especially suitable

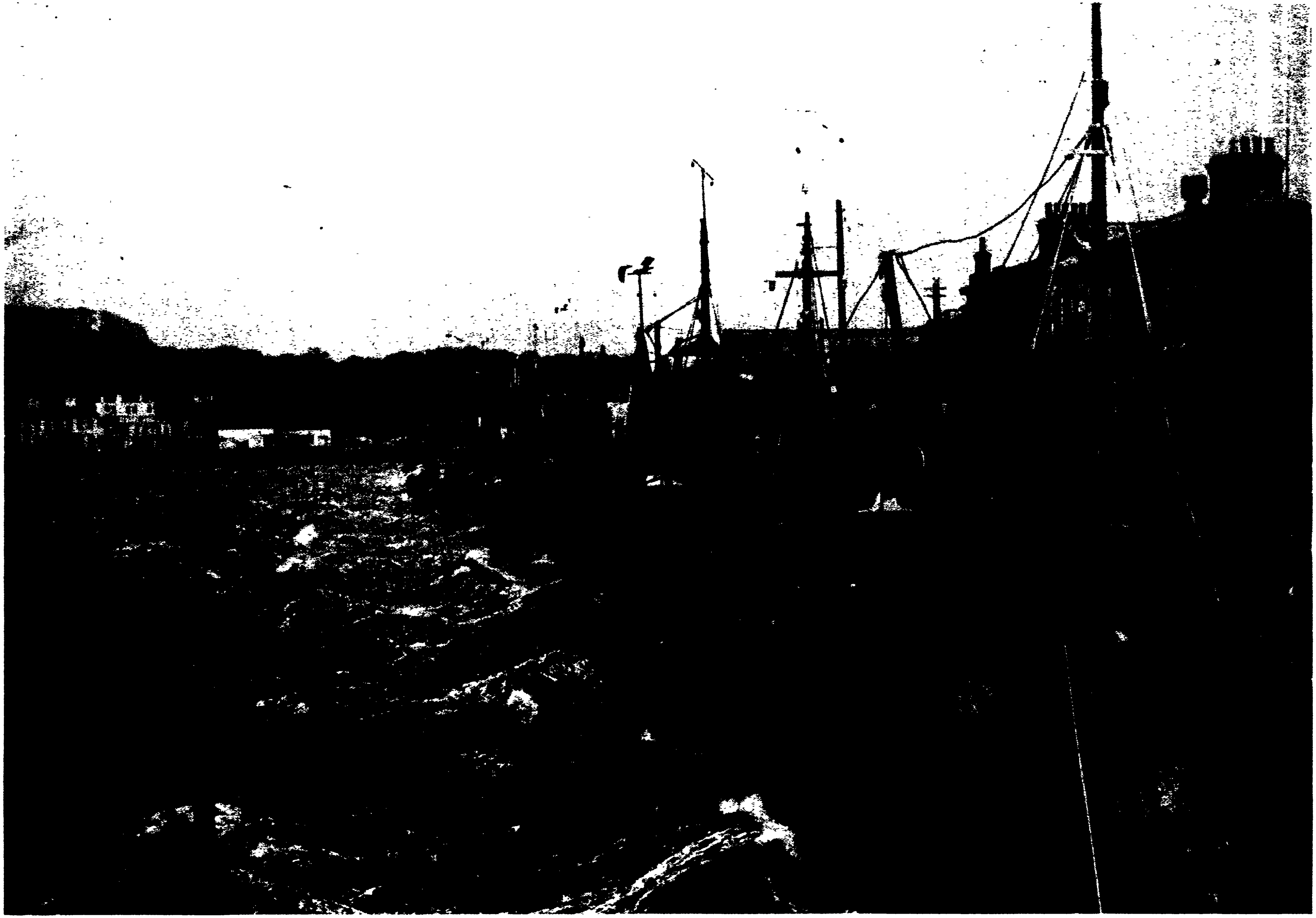
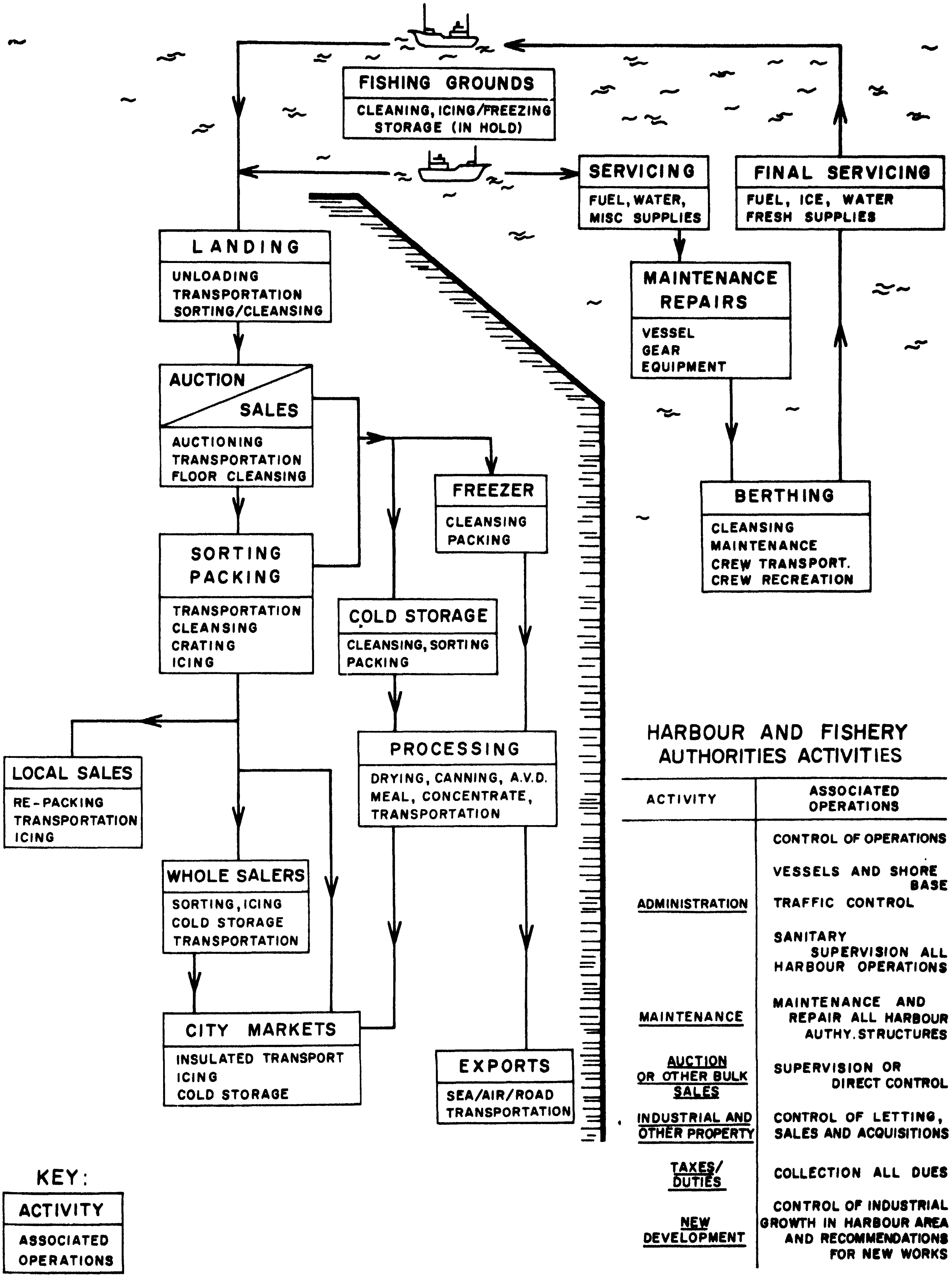


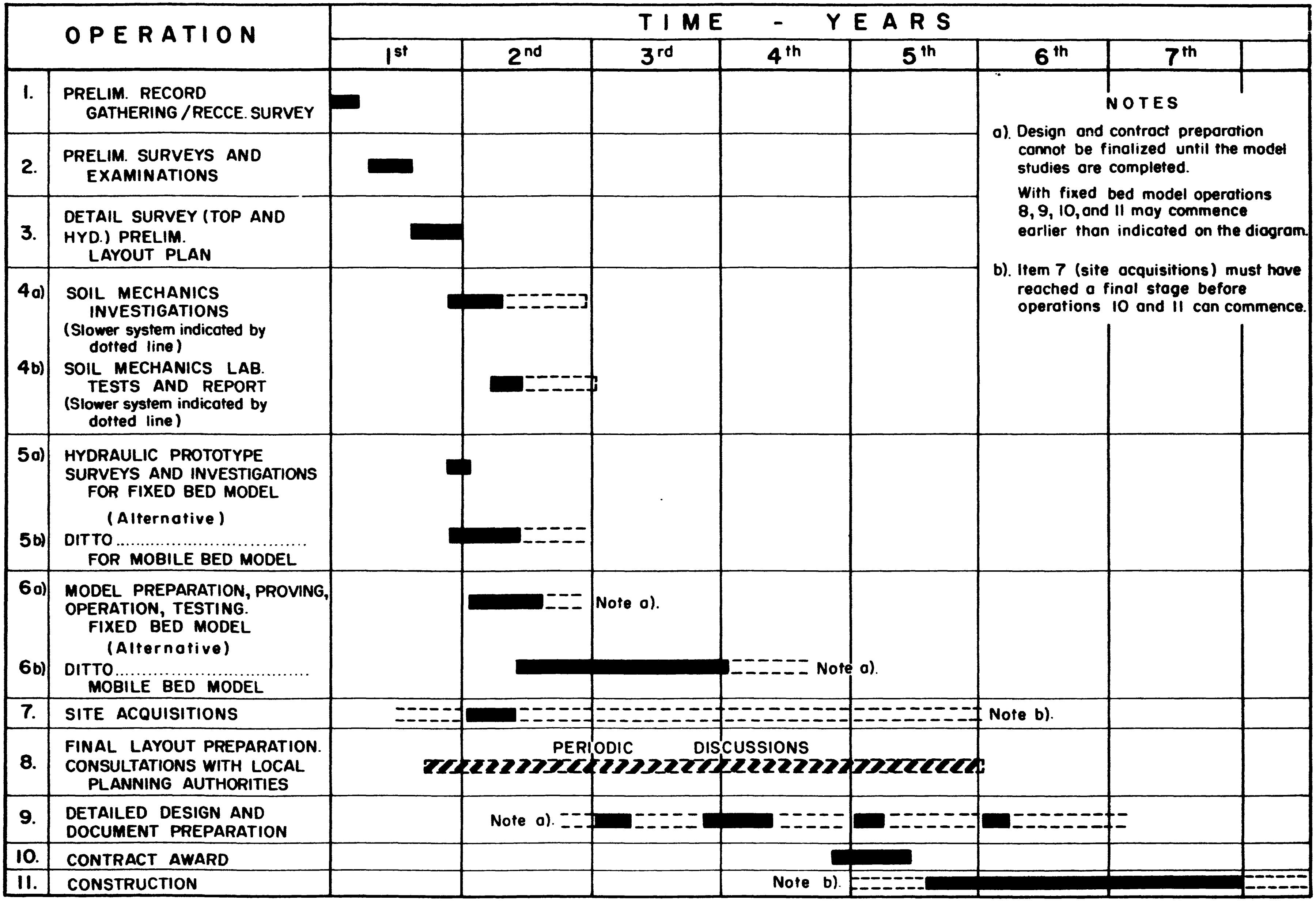
Fig. 4. An early 19th-Century fishing harbour with wave conditions which today would neither be tolerated nor necessary. Present-day sophisticated investigation aids help the planning engineer to avoid such conditions



HARBOUR AND FISHERY AUTHORITIES ACTIVITIES

ACTIVITY	ASSOCIATED OPERATIONS
ADMINISTRATION	CONTROL OF OPERATIONS VESSELS AND SHORE BASE TRAFFIC CONTROL SANITARY SUPERVISION ALL HARBOUR OPERATIONS
MAINTENANCE	MAINTENANCE AND REPAIR ALL HARBOUR AUTHY. STRUCTURES
AUCTION OR OTHER BULK SALES	SUPERVISION OR DIRECT CONTROL
INDUSTRIAL AND OTHER PROPERTY	CONTROL OF LETTING, SALES AND ACQUISITIONS
TAXES/ DUTIES	COLLECTION ALL DUES
NEW DEVELOPMENT	CONTROL OF INDUSTRIAL GROWTH IN HARBOUR AREA AND RECOMMENDATIONS FOR NEW WORKS

Fig. 5. The fishery harbour: chain of activities



NOTES

a). Design and contract preparation cannot be finalized until the model studies are completed.

With fixed bed model operations 8, 9, 10, and 11 may commence earlier than indicated on the diagram.

b). Item 7 (site acquisitions) must have reached a final stage before operations 10 and 11 can commence.

Fig. 6. Possible schedule of operations for preparation of one major fishery harbour project within a national harbour development programme

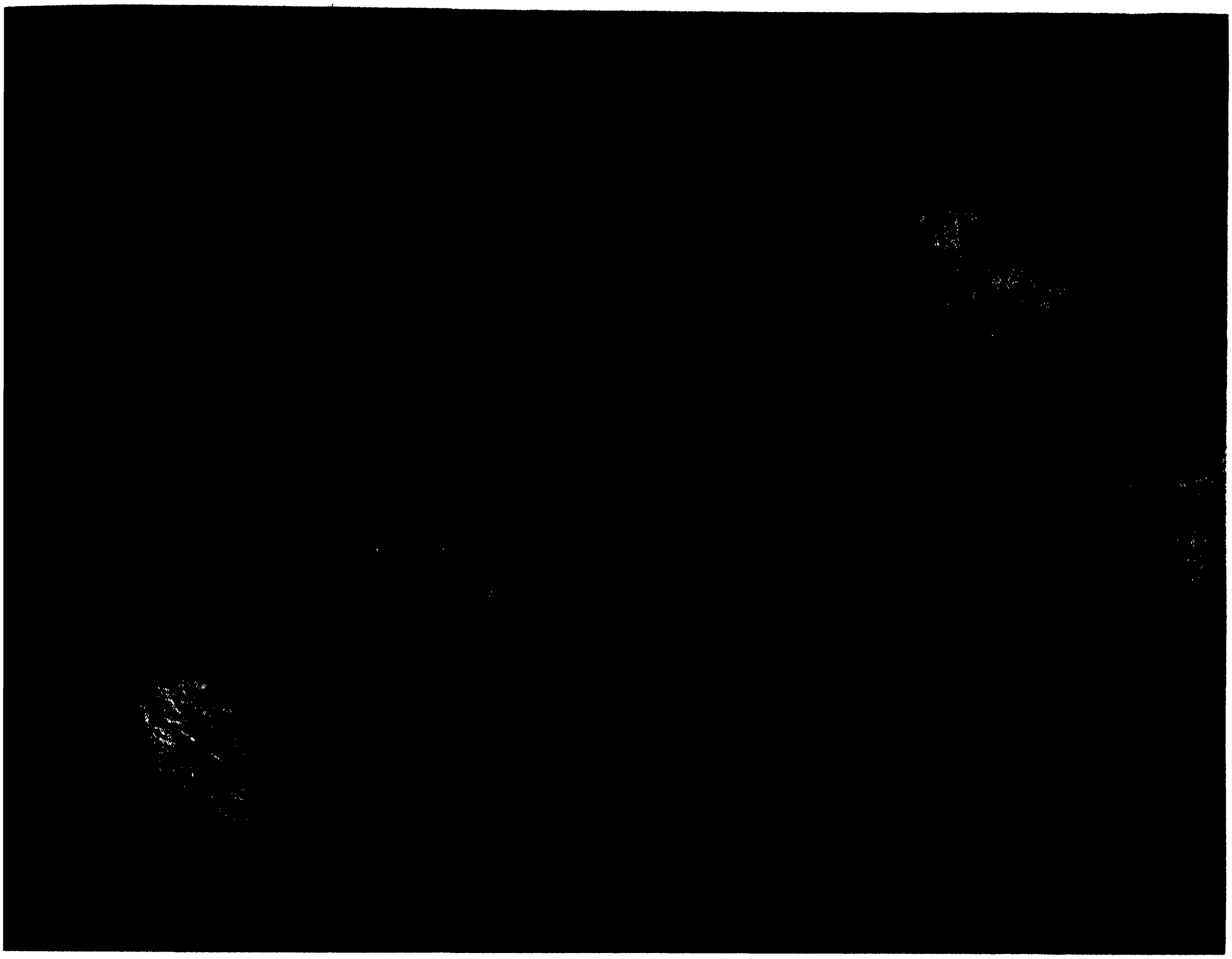


Fig. 7. Investigation of a proposed fishery harbour layout by using a hydraulic model in laboratory conditions. Purpose of investigation: study of wave reduction in basin approaches

for the investigation of a number of sites and, particularly, for the preliminary investigations Alte (1962).

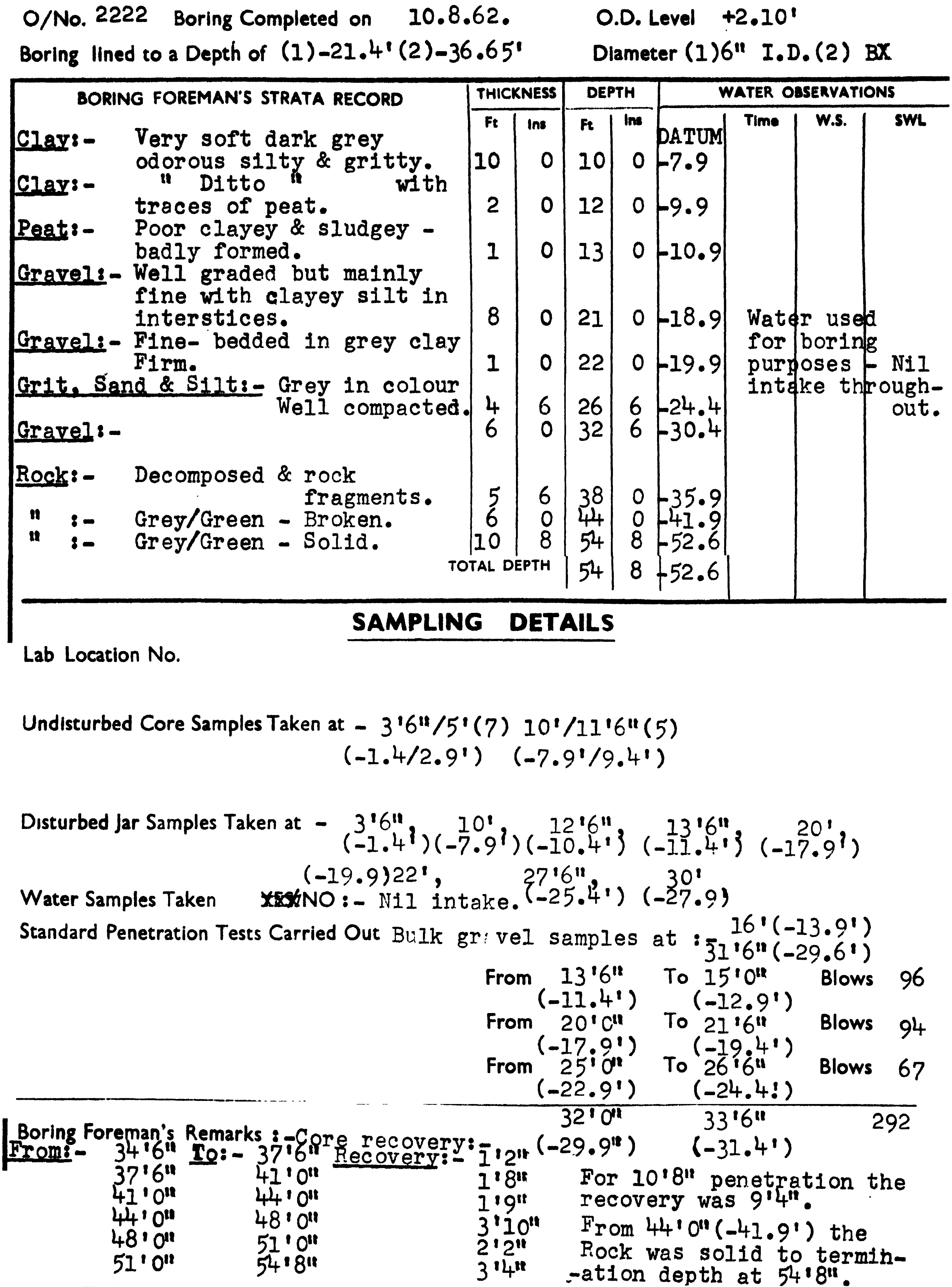
Frequently observations have been made by administrators without practical experience of the activities involved, that harbours could be built for the "sums of money wasted in useless investigations". This can readily be answered by referring to the uneconomic costs of overdesign or the risks of underdesign. In the consideration of a major project costing anything from $2 to $100 million, it is most necessary to obtain a full knowledge of all the conditions pertaining to the site before final layout plans and designs are prepared. What would be said if a harbour basin was provided only to be found that several metres of bed rock (previously unlocated through lack of soil mechanics investigation) had to be removed, or after the harbour was completed wave action caused massive destruction to the marine structures and all vessels berthed therein? The only scapegoat for such catastrophes would then be the engineer and his lack of proper site investigation. The cost of marine structural work per unit quantity is generally vastly greater than its equivalent in any other form of engineering project and the risks are correspondingly greater, due in some cases to incalculable hazards; a carefully conducted investigation, even at the expense of valuable time, is an essential preliminary to every harbour construction programme. Figure 6 gives some indication of the schedule of operations associated with a typical major fishery harbour project so that the operation can be correctly scheduled in relation to the other activities of the fishery development.

INFORMATION REQUIRED BY DEVELOPMENT BANK MISSIONS

Missions mounted by the International Bank for Reconstruction and Development or from the various Regional Development Banks to assess proposals for the financing of the foreign currency component of development projects are generally of three types—though within organizations slightly different criteria may apply—

(i) **Identified mission,** where the project required by the government is identified and a preliminary assessment of the feasibility prepared.

(ii) **Preparation mission.** From the identification mission will emanate the degree of further



O/No. 2222 Boring Completed on 10.8.62. O.D. Level +2.10'

Boring lined to a Depth of (1)-21.4'(2)-36.65' Diameter (1)6" I.D.(2) BX

BORING FOREMAN'S STRATA RECORD	THICKNESS Ft	THICKNESS Ins	DEPTH Ft	DEPTH Ins	WATER OBSERVATIONS DATUM	Time	W.S.	SWL
Clay:- Very soft dark grey odorous silty & gritty.	10	0	10	0	-7.9			
Clay:- " Ditto " with traces of peat.	2	0	12	0	-9.9			
Peat:- Poor clayey & sludgey - badly formed.	1	0	13	0	-10.9			
Gravel:- Well graded but mainly fine with clayey silt in interstices.	8	0	21	0	-18.9	Water used		
Gravel:- Fine- bedded in grey clay Firm.	1	0	22	0	-19.9	for boring purposes		- Nil
Grit, Sand & Silt:- Grey in colour Well compacted.	4	6	26	6	-24.4	intake throughout.		
Gravel:-	6	0	32	6	-30.4			
Rock:- Decomposed & rock fragments.	5	6	38	0	-35.9			
" :- Grey/Green - Broken.	6	0	44	0	-41.9			
" :- Grey/Green - Solid.	10	8	54	8	-52.6			
TOTAL DEPTH			54	8	-52.6			

SAMPLING DETAILS

Lab Location No.

Undisturbed Core Samples Taken at - 3'6"/5'(7) 10'/11'6"(5)
(-1.4/2.9') (-7.9'/9.4')

Disturbed Jar Samples Taken at - 3'6", 10', 12'6", 13'6", 20',
(-1.4')(-7.9')(-10.4') (-11.4') (-17.9')
(-19.9)22', 27'6", 30'
(-25.4') (-27.9)

Water Samples Taken ~~YES~~/NO :- Nil intake.

Standard Penetration Tests Carried Out Bulk gravel samples at :- 16'(-13.9') 31'6"(-29.6')

From	To	Blows
13'6" (-11.4')	15'0" (-12.9')	96
20'0" (-17.9')	21'6" (-19.4')	94
25'0" (-22.9')	26'6" (-24.4')	67
32'0" (-29.9")	33'6" (-31.4')	292

Boring Foreman's Remarks :- Core recovery:-

From:-	**To:-**	Recovery:-
34'6"	37'6"	1'2"
37'6"	41'0"	1'8"
41'0"	44'0"	1'9"
44'0"	48'0"	3'10"
48'0"	51'0"	2'2"
51'0"	54'8"	3'4"

For 10'8" penetration the recovery was 9'4". From 44'0"(-41.9') the Rock was solid to termination depth at 54'8".

Fig. 8. Specimen soil mechanics investigation borehole log. Completed according to British Code of Practice CP 2001 (57)

preparation that must be conducted by the government to enable a full study to be made of all facets of the project. When these results are available, the detailed assessment and recommendations will be made during the Preparation Mission.

(iii) **Appraisal mission.** When the work of the previous missions bear fruit, an appraisal mission is mounted to finalize the loan arrangements including a more detailed examination of rates of return, methods of financing the government's activities and assessment of credit arrangements, etc.

Where the projects include the development of new, or the extension of existing, harbour and associated shore facilities, the following engineering preparations should have been made at the various steps by the government with the aid of their advisers and, when necessary, reliable international consulting engineer firms with fishery harbour planning and design experience.

Identification mission

Information provided should be up to at least the preliminary reconnaissance stage for the alternative locations under examination. Maps and charts of locations should be provided—including as much subsoil information as is available. Aids to the mission in their assessment would include records of previous similar type development projects recently completed and a statement of the availability of construction material and construction plant in their country.

Preparation mission

This mission, as far as the engineering technical aspects are concerned, is equivalent to the final assessment. All information must be made available including, where required, detailed surveys, subsoil investigations and test results, hydraulic model and prototype investigations, layout plans with their order of cost estimates for the various alternative recommended locations and layout versions. Detailed quantities, rates and prices must be prepared and typical specification documents available for scrutiny. The detailed design should be at the stage of preparation in which it could be submitted for contract with the other documents within a short period of time (perhaps three months) thereafter.

Appraisal mission

As far as engineer activities are concerned, this is a repeat of the preparation mission except that in the intervening period all contract documents should be finalized for the selected projects and ready for tendering when the necessary approvals are obtained.

Supervision

The custom of most of the regional financing organizations or agencies is to recommend international consulting engineer firms for the completion of the preparation work, and the contract work involved to be submitted for international tenders. In this way a reliable set of tenders should be obtainable. However, during the progress of the actual construction work, certain engineer and financial supervision will still be conducted by the agency to ensure proper standards of design and workmanship and to certify that foreign currency or other loans are being disbursed in a proper manner.

For the purpose of assisting governments seeking aid for fisheries or other developments, the FAO/IBRD Cooperative Programme have prepared a document entitled "Outline of Projects to be Presented for Financing" (Rome, 1967), containing guidelines for the preparation of fisheries projects for financing by the International Bank for Reconstruction and Development.

Costs and estimates

Figure 9 has been prepared to indicate the range of unit costs for specific works operations associated with fishery harbour development. The range of costs must, of necessity, be wide as it covers, amongst other items, a wide variation in labour rates (e.g. from a fraction of a dollar to several dollars per hour) and efficiencies; the uncertainty of availability of effective plant, equipment and local materials; and a great variation in national import duties on such commodities.

PLANNING THE HARBOUR: ASPECTS TO BE CONSIDERED

In planning a fishery harbour the engineer must concern himself with many differing branches of engineering—physical planning of the complex, roads and railways, municipal engineering, marine civil engineering in concrete, steel and in the many new materials; mechanical and electrical engineering, structural design and layout, marine investigations and laboratory techniques; and of others, the important economical aspects of the engineering project is of prime importance. To adequately refer to even one of the aspects would require a lengthy volume; in this paper, therefore, I would mention only some of the topics that have seemed important which have been overlooked in the preparation of national projects or inadequately dealt with.

For this purpose I group my remarks under the various sections of the harbour project:

(i) **Approaches from the sea.** For the benefit of the vessel returning to port, after perhaps a long trip at sea, the first landfall and the approach to the harbour should be made as readily identifiable as possible, both visually and electronically. This must include beacons, navigation lights and, as far as possible, electronic location fixing of the Decca Navigation or other similar type. Ships' radar will, of course, also help.

To enable the final approach to the basin to be completed in safety, channels of adequate depth, without hazard in the form of rocks or unmarked or unlighted structures, must be provided. The channels should be laid out, when necessary with the help of hydraulic model studies, in such a manner that minimum maintenance dredging is required. If possible, a greater depth should be provided initially to meet the needs of vessels with slightly greater draft than that included in the immediate plans.

ITEM	DESCRIPTION	UNIT OF MEASUREMENT	RATE $ U. S.	REMARKS
1.	**BREAKWATERS**			
1.1	Core material, rock	m^3	1 to 5	Based on relatively short hauls by. road.
1.2	Armour layers, rock	m^3	3 to 20	
2.	**QUAYS JETTIES, ETC.**			
2.1	Steel sheet pile face with backfilled quay surface	m^2 (surface area)	50 to 200	Limits depend mainly on length of pile and width of quay.
2.2	Openwork quay, reinfoced concrete	m^2 (surface area)	70 to 180	Assuming simple structures and uncomplicated foundations.
2.3	Openwork quay, timber	m^2 (surface area)	30 to 60	
3.	**DREDGING & ROCK REMOVAL**			
3.1	Rock removal under water	m^3	10 to 300	Depending on quality, quantity, depth and if covered by loose or soft materials, location etc.
3.2	Rock removal on land	m^3	1 to 3	Depending on stiffness of material, amount of boulders or shingle present and type of dredger employed. An average cost for large quantitaties of soft material might be 0.3 $ per m^3.
3.3	Dredging	m^3	0.1 to 3.0	
4.	**PORT BUILDINGS**			
4.1	Prestige Buildings	m^2 (floor area)	50-100	
4.2	First class storage, auction hall with offices, sorting halls, etc.	m^2 (floor area)	20-40	
4.3	Sheds, open buildings	m^2 (floor area)	10-30	

5.	BOATLIFT/BOATSLIP REPAIR YARD			
5.1	Boatlift for 100^{ft} vessels	lump sum	50,000 to 90,000	
5.2	Boatslip alternative (with good foundations) for 100^{ft} vessels. Slope 1 : 15 Tide range 3 m.	lump sum	100,000 to 180,000	
5.3	Boatyard bulding and facilities for approx. ten vessels without reclamation	lump sum	80,000 to 180,000	
6.	ICE PLANTS			
6.1	50^{Ton}/day - 250^{Ton} Bunker with loading conveyors inc. installation	lump sum	85,000 to 200,000	Depending on type of ice manufactured, building type and geographical location.
7.	MISCELLANEOUS AND SERVICES Navigation light; Port machinary; Services,(elect., sewage, surface drainage, fresh and saltwater supplies, fuel oil); Cold storage and refrigeration; Industrial plants. These items vary considerally from country to country and from site to site and cannot readily be estimated without local information.			
8.	OVERHEADS, CONTINGENCY, ETC. This item for marine works of considerable proportions may vary between 10% and 20% of the total estimate of works items on the assumption that normal supervision costs are included in the works items. Special additional contingencies may also be required for the more uncertain operations e. q. dredging, rock removal, difficult foundations, etc.			

Fig. 9. Rough estimates of cost limits for typical fishery harbour construction items

The approach channel should, as far as possible, be free of wave action and should be of sufficient width to permit two vessels of the largest type based at the port to pass without difficulty.

Navigation lights on the inner reaches should be of lesser intensity than those of the ranging lights to avoid misunderstanding by approaching vessels. Lights should always be specified according to the approved International System.

(ii) **Basins.** Adequate harbour basins must be provided. Wave action or seiches should not occur within this area; they must be sufficiently large and safe for the manoeuvring of vessels approaching and leaving the berths, for the use of vessels lying at anchor while awaiting unloading or servicing facilities, and for the use of maintenance and dredging vessels and floating plant which will periodically operate in the port.

(iii) **Quays: General.** Adequate depths should be provided to enable all vessels based at the port to lie afloat alongside their quays at all stages of tide. Adequate fendering should be provided **on the quays,** as larger type vessels cannot be relied upon to provide their own.

Bollards must be provided at close intervals along the quay coping, a minimum interval of about 10 m (33 ft) is desirable for vessels up to about 40 m (130 ft) class. Larger bollards might also be provided at wider intervals for the occasional visiting commercial or industrial vessel or factory ship.

Quays should be well lit for ease of access by personnel and vehicular traffic and additional concentrated lights (e.g. floodlight systems) made available for use when required for unloading or other operations on or near the vessel.

Every quay should have adequate steel ladderways to permit personnel to board or land with ease—especially where high tidal ranges exist. Wide openings with staircases should be omitted unless they are fully fendered and protected to enable vessels to lie alongside in safety even while ranging in rough conditions.

Potable water for servicing vessels should be readily available at all quays and at adequate intervals fire hydrants should be provided. If possible, all water points should be capable of rapid use for fire precaution purposes. Adequate provision for the suppression of oil fires should also be made.

Quays, provided for whatever purpose, landing, servicing or berthing, should have a clear space between the face and the nearest service building, e.g. auction hall, ice plant, net shed, etc. Sufficient width to provide freedom for two lines of truck traffic (a minimum of 10 m or about 30 ft) should be provided.

(iv) **Services and buildings.** Adequate space in auction halls for display and auctioning of fish on sale should be provided. Since this operation takes place frequently in early morning hours a high level of light intensity of suitable variety (see vii below) should be installed. Auction and display halls of whatever layout or structure should also have through access from front to rear at regular intervals for vehicles and forklift trucks.

Ice plant for the production of the total present and future vessel requirements should be planned at the quayside with conveyor systems feeding directly from the storage bunker directly into several vessels simultaneously. Since many modern vessels take upwards of 25 tons of ice on their fishing trips, this loading operation should have very close consideration both in the provision of maximum ice quantity per m^2 of plant building, the type of ice provided and the capacity of ice bunkerage. A variety with ease of handling and storage on the vessel, with minimum of crew hours of handling, should always be provided for vessel operation. Modern types, e.g. tube ice, seem to have many advantages over the block varieties.

(v) **Vessel and equipment repairs.** One of the first structures made available to fishing vessels in a modern harbour should be a repair yard with means of lifting the vessel out of the water. Repair shops and stores for replacements of the mechanical, electrical and electronic equipments should also be available nearby staffed with skilled maintenance personnel.

In many older harbours with their now congested conditions, the provision of a slipway and boatyard has been impossible due to lack of adequate sea space for the long 1 : 15 slope slipway and its associated lead-in jetty alongside. Several ports have been unable to provide the necessary minimum maintenance services for their fishing vessels on this account. The concept of the boat lift, either of the patented "Synchrolift" type, the gantry and harness variety or the hydraulic lift, in many instances can help in solving this problem. The system is readily adaptable for handling vessels for repair as well as for launching new vessels. It can serve both a repair yard and a vessel building yard with a simple extension of the transverse carriage railway system when both these facilities are sited close to each other.

(vi) **Roadway systems.** With the many and complex activities of even a moderate sized fishery harbour, it is most essential that care is taken in the layout of the roadways. Flow diagrams should be prepared and carefully studied to assist in the layout pattern. Parking areas should be provided at the most suitable locations for vehicles (a) awaiting immediate attention, (b) those that are delayed for considerable periods and (c) casual visitors.

Tourist traffic in the more scenic areas can be of a very high intensity and must be catered for either within or just outside the harbour installation. More than one harbour, for instance, caters for tourist visitors by presenting them with propaganda literature and fish recipes in addition to providing car parking accommodation.

(vii) **Lighting services.** Much room for improvement exists in the lighting of most fishery auction halls and outdoor sorting and display areas. A high intensity of lighting should be provided. Sodium lighting with its yellow coloration and mercury vapour with its green or blue tones are unsuitable for identification of fish quality. It seems that the most suitable are the several forms of daylight type fluorescent lamps. Rectification of colour of the other forms may, however, in the future improve these types. The less efficient tungsten is generally too costly in operation for consideration as a high intensity light.

(viii) **General planning.** Many fishery harbours in the past have been planned within the area of a "parent" commercial harbour. This may have been in the mistaken belief, or hope, that the parent will provide the sophisticated machinery, maintenance facilities and dredgers etc. to enable the fishery port to operate with the minimum of expenditure on maintenance tasks.

There are many instances of these ports coming to grief—even in a very short period following their establishment. The paper from Mr Axelson points to a few of the difficulties experienced at Gothenburg. Karachi's new fish port is now threatened after a short period of operation by a thriving and ever-growing commercial port which must expand to many times its present size in a short number of years. It must surround and thereby greatly restrict its smaller neighbour. In the early stages of planning a fishery harbour in the city of Galway there has also been difficulty in locating it in competition with the adjacent commercial port due to rapid expansion of the commercial activities. These and many other less obvious examples have convinced the author that to consider the establishment of a fishery port within the limits of a thriving commercial port is wrong despite the many attractions that the union may seem to offer.

As is the case of location within the commercial harbour, there have been many instances of strangulation of port development by the lack of available land space for shore development and/or the lack of suitable sea room for an expanding fleet. One new fishery port in the East has planned for this by providing 110 acres of reclaimed land as a first stage provision, together with a further 110 acres available if required at a later stage. Such foresight is not always the case and, of course, it is not always possible, but it does indicate the extent of free land that might be needed by a new and developing industry.

Such forward planning cannot be proceeded with unless the many other planning authorities are brought into the project at an early date and land earmarked for fishery development either purchased immediately or set aside for compulsory acquisition when required without further enhancement of value. A project should not be hamstrung by private land grabbers or speculators; delays in acquisition and unjust increases in land costs could have serious consequences to a developing industry.

CONCLUSION

The development of fishery harbours as such has been a relatively new undertaking for many countries recently entering into major fishery activities. Many new problems have been posed and many new means have been provided for solving them. Basically, however, the problems of construction are those that were met with by the Greeks and Romans of the pre-Christian era. In those days manpower was never a scarce commodity so the massive structures of those periods can still be seen in all their splendour.

Other examples might be cited of the eighteenth/nineteenth-century European fishery harbours, e.g. Kinsale in Ireland, with its over 600 large fishing schooners and its many large Norwegian ice storage hulks for herring or mackerel. In later years Austen (1907) wrote in great detail of development of British fishery harbours then operating or contemplated.

Present-day fishery harbour engineering may therefore be described as a sifting and garnering of all previous experiences of generations of harbour engineers developed with the aid of modern technological processes and applied to suit the needs of the particular national industry. Many differing solutions and developments will be obtained to more or less satisfy the demand.

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DISCUSSION

PRELIMINARY PHYSICAL AND ECONOMIC INVESTIGATIONS

Marchal (France—Chairman) stated that a fishing port was a very complex concentration of activities. Its planning could give rise to very different solutions. The fishing port of our parents and grandparents had become a precious museum piece. Though of course, for human and economic reasons, small-scale fishing must continue, and take into account further mechanization and modernization, but it would remain limited to coastal fishing. Besides these developments in the fishing industry, concurrent developments of fishing port characteristics were necessary: larger and deeper basins and longer quays were needed, and a whole infrastructure of facilities had to be completely adjusted to the products being landed. An attempt might therefore be made to draw up a classification of fishing ports according to the types of vessels to be based there and the nature of the products to be landed. He believed that, for the time being, the definition of a fishing port as given by Bruski would have to be accepted: "the complex of facilities ensuring safe berthing of fishing vessels and guaranteeing necessary service".

Alte (Sweden) introduced himself as an Engineer specializing in site investigations especially for harbour planning. He believed that the expression "Site Investigations" was most commonly used in English to describe the various physical investigations. The several different types of Site Investigation to be carried out before a proposal for a new or extended harbour could be prepared included:

A. *Topographic and hydrographic surveys*

These would cover the proposed harbour and shore development area, alternative sites, breakwater locations, the various harbour approaches by sea and land, and would include measurements of velocity, direction, magnitude, etc. of winds, waves and tides and measurement of currents and sand drift.

A proportion of this survey work might in some cases be more conveniently and economically carried out by photogrammetry methods which could reproduce land contours with great accuracy.

B. *Soil mechanics investigation*

This investigation would produce information about the characteristics of the site materials. The level and quality of bedrock, the characteristics of the soil with regard to sand drift, suitability of material for reclamation purposes, foundation conditions for marine structures and shore establishments. They would also give the characteristics of material to be dredged.

C. *Hydraulic model studies*

These involved the examination of wave and current conditions of existing and developed sites; studying the future risks of sand drift and its effect on proposed structures.

The importance of careful site investigation was pointed out very strongly in several papers. In the Introduction to FAO Report No. 36, on "Landing and Marketing Facilities at Selected Sea Fishing Ports", Kaufmann stated that favourable natural factors such as adequate shelter, water depth, availability of space, tide, winds, silting, etc. greatly facilitated construction and reduced expenditure. He referred to West Africa where the physical factors in certain places made the construction of ports economically impracticable. One such example had also been quoted by Guckian where the development of a harbour site in Ireland had been found to be three times more expensive than the first cost estimate solely because of unsuitable subsoil conditions.

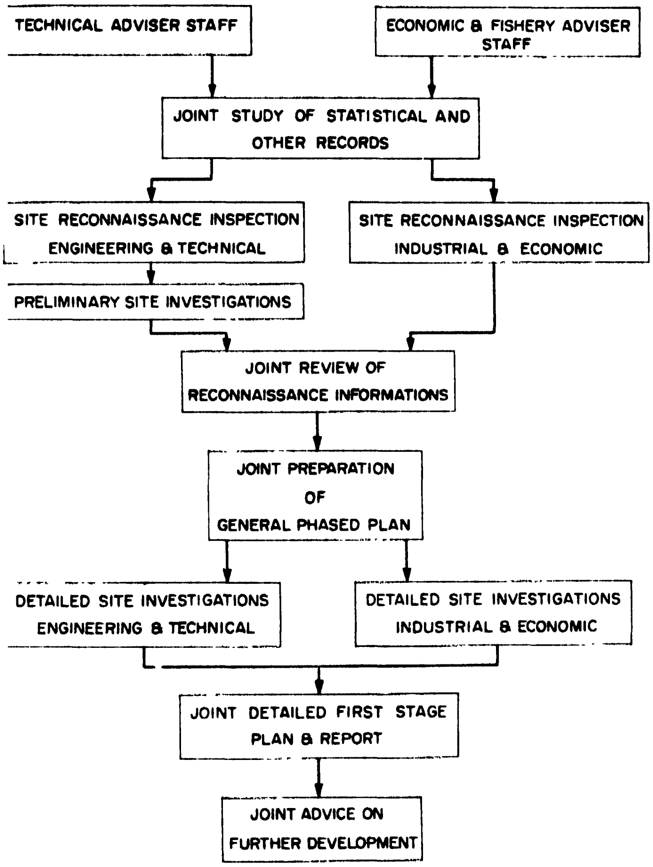
The obvious importance of carefully conducted site investigations with regard to winds, waves, tides, currents and soil conditions, was clear and adequate information should be made available as early as possible in the planning period. However, the fact that mistakes were still occurring made him feel that appropriate steps were not being taken to include adequate investigations in the planning for fishing harbours. He therefore wished to draw the attention of participants to certain factors which he felt were important in this regard.

When should the site investigations be carried out?

Guckian, in a paper (1966), gave a diagram of the organization and different activities of a fishing harbour planning team. Basically the organization might consist of two teams:

> An economic and general fishery advisory team, and an engineering advisory team.

Some of the problems involved could and should be handled separately but many problems could only be solved by joint examination. This diagram of the desirable programme of investigations was used in Mr Guckian's paper of 1966:


TECHNICAL ADVISER STAFF
ECONOMIC & FISHERY ADVISER STAFF
JOINT STUDY OF STATISTICAL AND OTHER RECORDS
SITE RECONNAISSANCE INSPECTION ENGINEERING & TECHNICAL
SITE RECONNAISSANCE INSPECTION INDUSTRIAL & ECONOMIC
PRELIMINARY SITE INVESTIGATIONS
JOINT REVIEW OF RECONNAISSANCE INFORMATIONS
JOINT PREPARATION OF GENERAL PHASED PLAN
DETAILED SITE INVESTIGATIONS ENGINEERING & TECHNICAL
DETAILED SITE INVESTIGATIONS INDUSTRIAL & ECONOMIC
JOINT DETAILED FIRST STAGE PLAN & REPORT
JOINT ADVICE ON FURTHER DEVELOPMENT

Desirable programme of investigations. Diagram from 1966 paper by Guckian

The speaker strongly recommended division of the site investigations into two parts: first, a preliminary, limited site investigation in connexion with the site reconnaissance in the second stage of the planning work and, secondly, a detailed site investigation in the following third stage.

In the second or third stage, observations or results might point to the necessity of major additional examinations or investigations, for instance, hydraulic model tests, special soil tests or site load tests, etc. Site investigations such as these or others for wind and wave recording might have to continue for a long period before definitive results, capable of being used confidently in the design preparation, could be obtained.

There was little need to talk to engineers about the necessity of detailed site investigations in the third stage. The necessity for these should be quite obvious to anyone preparing a costly project. The preliminary site investigations in connexion with the first site reconnaissance were, however, often erroneously considered unnecessary, especially when planning a smaller harbour. He considered it very definitely necessary to carry out these limited site investigations at such an early stage of the planning work even though site investigations were time-consuming and might increase the planning costs of each site by from 10 *per cent* to 30 *per cent*, depending on local conditions.

After the second stage of the preparation work, when the General Phased Plan had been prepared, it should be presented to different governmental and municipal bodies and to the industry, etc. Discussions could then start regarding the various characteristics of the alternative sites. There were many aspects to be considered, social and political factors as well as pure economic fishery and engineering considera-

Finally, he pointed out the three most important elements connected with fishery planning:

(1) the fish resources;
(2) the harbour complex with its vessels and facilities;
(3) the consumer.

To enable a satisfactory industry to be built around these elements would depend in the long run on the adequacy of the physical and economic investigations carried out.

Full investigation necessary

Guckian (FAO) said that adequate engineer investigations for marine works in general and fishery ports in particular were absolutely essential where a port development, or a programme of port developments, was to be implemented. Investigations have always been necessary and have invariably been conducted, or omitted in certain cases, by engineers to their peril. He had an example of this, a feasibility study carried out in 1803, for a new commercial, and to some extent fishery, port at Coleraine, Northern Ireland. The report on these investigations by John Rennie, an eminent English engineer of his day, recommended that the proposed project should not be proceeded with because of the site conditions. It was of further interest to note that recently this same active and developing township had been anxious to provide a deep-water harbour to serve its diverse trades and industries. Much investigation has been carried out by eminent consulting engineers together with the Hydraulics Research Station at Wallingford. While the speaker had not been a party to any of those investigations, he understood that the findings of Rennie in 1803 had been fully vindicated and marine works of the type requested could not be economically provided or maintained.

There were many difficult problems involved in the development of fishery harbours, especially with projects on virgin sites in many of the developing nations throughout the world.

Frequently, from lack of knowledge of the situation, Administrative Departments were impatient with the length of time taken by investigations and with their cost. If the Conference was to assist member governments in their development, it must be made clear that there were few short-cuts or inexpensive gimmicks in this work.

To develop an elaborate and costly project costing perhaps tens of millions of dollars, much wasted expenditure could be saved and many pitfalls avoided by adequate investigations. How would the engineer be treated if he caused the erection of a port where within a few years sand drift made it untenable except at extremely high maintenance costs? How would he be treated if, after construction of the port facilities had been proceeding for some time, it was found that the million or so cubic metres of soft sandy clay to be dredged at say $0.3 to $0.5 per m^3 in fact became a quarter-million cubic metres of sandy clay and three-quarters of a million cubic metres of rock costing between $10 and $30 per cubic metre for removal? Who in this instance would provide the extra 20 or so million dollars, or who would give the order to abandon works already executed? One thing was certain, the engineer would be blamed. Was he guilty? He suggested that he was guilty of not advocating and insisting on an adequate programme of investigations before committing himself to detailed planning. Jackson, in his opening speech, had referred to the time element in the preparation of the development programme for fishery harbours. In Guckian's paper, a fictitious schedule of investigation operations was given for one harbour including most of the investigations already referred to by Alte and he drew attention to one of the more controversial items of that particular schedule—Item 4, the Soil Mechanics Investigations. This operation might take anything from 3 months to more than 18 months to complete, depending on the system of investigation chosen and the limits of the site. Here, then, was one field where improvement was necessary.

Problems in Mexico

Gutierrez Lopez (Mexico) stated that he would like to stress the need for developing countries to obtain in greater detail the importance that must be given to the preliminary studies for the development, not of the larger ports, but in particular of the small landing places which would enable smaller fishing communities, whose social level was very low, to expand their activities and provide much needed development. His delegation would like to know what kind of investment should be given to this type of study.

Scheiner (IBRD) said that he would like to lay stress on some of Gutierrez Lopez's words. In his work for the World Bank, which involved visiting many countries and assisting many projects, not only for harbours and roads, but educational and other very important projects for the country, he had found that the management and preparation in advance of the actual project were very inadequate.

In this respect, he greatly regretted that there appeared to be no representative in the present gathering from India, a country which had so many fishery problems, especially in the spheres of port and marketing development, maybe as great as all others put together.

Scheiner stated that he was a port engineer with many years' experience of design and construction as well as the detail planning aspects, but over the passing of the years while visiting and discussing with developing countries, he had found, to his amazement, that engineers and so-called consultants often made the mistake of rushing into the actual design and execution process without due preparation.

There was still a very big bridge to cross before the management problems in developing countries were solved, since in so many developing countries, in South America, Africa and the Far East (except of course for a few of the more sophisticated countries), the fishery industries had always been given secondary importance to other industries and only third- or fourth-class management had been seconded to their activities.

Had members of FAO or IBRD or UNDP really tried to tackle first of all the background which would in future years assist in providing a proper fishing industry, not just for the short-term, with the construction of a port with the only investigation limited being as to whether it should have a 3 or 5 m draught? There were countries where 30 or 40 vessels had been brought, designed maybe by other countries or organizations who intended to sell those vessels at all costs, but after a short time they were breaking up in the port as there was nobody to man them or maintain them. This was a problem of major importance to which more time should be devoted in this important gathering than to the physical construction of ports. That construction should be considered as a second step after the solution of the problems of management, background and environment so that a really efficient industry could be achieved.

Lomeli Delgado (Mexico) said that during the last few years in which Mexico's national fishery production had increased, they had found, with great surprise, that the greatest volume was in the North-Eastern zone, in an area lacking adequate fishing ports. On the other hand, they had perhaps the most modern fishery port in Latin America at Alvarado in the Gulf of Mexico where there were few fish resources.

His country had not yet solved the problem of marketing and of educating the public to take advantage of this new food source. They were anxious to find in this Conference the best solution for immediate implementation, instead of waiting for 4, 5 or 6 years, with a view to increasing as soon as possible this industry which was such an important food source. The question was a rather complex one: what could be done to develop the industry within the existing facilities, without waiting for a long time for solutions which might be theoretically very good but in practice could not be implemented due to the lack of economic, physical and technical resources. It was important to do something for their fisheries quickly.

Ocampo Siguenza (Mexico) explained that Mexico was made up of two worlds: the urban world, where about 50 per cent of the population lived and on which, to a great extent, the economy of the country depended and the rural sector with its small towns, none of which exceeded 1,000 inhabitants. This large number of smaller groups created problems which could not readily be solved at the present stage of development. When looking for solutions for the small fishing communities with terminal fishing ports, the whole context of the problem must be considered. He believed that the developing countries must of course look into the question of the small communities but they should make use of modern technology to assist them.

Canadian viewpoint

Hurst (Canada) said that the major problems appeared to be in the areas of sociology, economics and the other social sciences which involved dealing with the people who actually fished, the people who marketed and the people who sold fish. Canada had similar problems to Mexico in that they had a large number of small harbours established over a long period of time, which in the era of modern techniques, of larger vessels, of freezing fish and the facility for rapid transportation between major centres, made them very uneconomic to operate. One of the major problems in the North American continent as well as in Africa and Asia, and quite possibly in Europe as well, was to try and concentrate the fishing activities in a smaller group of major ports. This involved providing also the amenities like schools, hospitals, churches and recreation facilities for the fishermen and their families. Those who wished to spend their lives in the small ports were decreasing in numbers. The new fishing populations were more interested in having the normal amenities and it was these people who had to be planned for. This might mean the abandonment of certain smaller fishing harbours, the reconstruction of others and the adaptation of a number of major fishing ports.

Another aspect needing consideration was the question of the changing technology and the changes in major commercial ports as well. The advent of the super-vessels, the supertankers and the super-cargo vessels was making some of their commercial ports obsolete and it seemed that this might in some case offer an opportunity for readjusting existing fishery port facilities which were out of date by incorporating at least parts of the obsolescent commercial facilities.

Dopplinger (Canada) also spoke of their problems in the realm of developing fishing ports and markets in the Newfoundland region. Newfoundland had developed over the past few hundred years mainly as a region of small outports where the individual fisherman caught his fish from a small boat and converted the freshly caught fish into salt fish by drying it on shore and processing it himself with the help of his family. Now, this type of small enterprise operation was definitely on the way out and could not be continued on an economical basis. The Canadian Government was trying to encourage the fishermen to leave the small outports and move to designated major fishery centres. Over the past two or three years the Government had looked into the site selection of these major fishery growth centres from various points of view. Most existing harbours had been established for a great number of years and soil conditions, topographical conditions, transportation and so on were well-known factors and did not need any further investigation, as was the case in newly-developing countries where such factors were not known.

FAO experience quoted

Guckian (FAO) replied to a number of points raised by participants, especially Dopplinger's remarks on the Canadian ports not needing investigation for their further development, and the queries of the Mexican participants. He quoted O'Meallàin, who had elsewhere defined a subsoil investigation borehole of 4 in diameter. He had very truly stated that if, for instance, rock was located in this borehole at 40 ft, the rock over a diameter of 2 in radius from the centre of that circular borehole would be at 40 ft depth, but a further inch outside that, it could be anything from 25 ft to 140 ft. As far as site investigations were concerned, he did not think that enough was known about the conditions at any site in any situation in the world, whether it was Canada or India. Where works were to be proceeded with as extensions, additional investigations, though perhaps more limited in extent, were invariably required.

With regard to the Mexican difficulty in providing fishery ports, they were more fortunate than many of their neighbouring countries in having a number of fine fishery ports available. Taking the case of Ecuador, where there was only one commercial port on the coastline, the port of Guayaquil, perhaps 50 km from the sea, there were no fishing ports anywhere apart from a few very inadequate facilities at Esmeraldas, Salinas and Manta. These were capable of providing facilities for perhaps two vessels, while at each centre there might be based between 20 and 60 vessels varying between 40 ft and 120 ft in length, apart from the usual small craft. The same applied to India which was probably the fifth major fishing nation in the world in regard to tonnage landed and yet they had virtually no fishing ports throughout the whole of their extremely long coastline. There were one or two rather small docks, one of which was the Sassoon dock at Bombay. Another had been constructed at Veraval, but beyond these there were merely very poor facilities at a small number of the smaller commercial ports where they were barely tolerated. Canada and Mexico were very fortunate in having ports for conversion into fishing ports but one should be very careful in this transfer or coordination of fishery port facilities within commercial ports. Axelson's paper illustrated some of the difficulties involved in having a fishing port inside a growing commercial port. Recently FAO had been concerned with Karachi where a very fine fishery port had been developed less than 10 years previously to serve perhaps 100 to 200 fishing vessels. There were now 2,000 fishing vessels and the port was unable to cope, but the ever-increasing commercial harbour would absolutely swallow up the site in their next five-year development stage. This would mean either a curtailment of existing fishing activities and an inability to expand or a reduction of industrial area available and non-approval of certain desirable processing developments. He added that Karachi had at present a very large shore facility development area but not the necessary sea space, basins, or approach channels to get the boats into the port to land the fish or to berth these vessels. But what was the good if tomorrow this inadequately investigated project of 8 to 10 years before had to be restricted or curtailed? There were several other cases of the consequences of providing a fishing port within a commercial port, due to the rapid development of the commercial port swamping out its poorer relation and leaving the fishery industry in even worse straits than before the fishery port was built.

Help is available

Jackson (FAO) said that a previous speaker had suggested that it was difficult for developing countries to obtain adequate information and advice for determining their programmes and priorities in fisheries development and to make ready for the raising of capital and the beginning of construction. In his view there were a number of sources to which a developing country could turn. These included:

(a) national research institutions;
(b) bilateral aid programmes;
(c) the advice and assistance of comprehensive private consulting firms;
(d) technical assistance under the United Nations Development Programme;
(e) pre-investment project assistance under the Special Fund sector of the United Nations Development Programme;
(f) advice from the regional, international and intergovernmental fishery bodies (particularly on fishery resources and statistics);
(g) technical assistance and advice from the International Bank for Reconstruction and Development and the several Regional Development Banks;
(h) advice and assistance from the Department of Fisheries of FAO.

Chapman (U.S.A.) brought forward the question as to what was the viewpoint to be used in selecting the site for a fishing harbour development: local, national, regional or worldwide? He used the example of the effort required to maximize the sustainable yield of the Arabian Sea. The harbour at Aden, for instance, was uneconomic to develop from the viewpoint of the Aden Port Authority, but if this same cost was looked at from the regional viewpoint of the Asian Development Bank or from the global viewpoint of the IBRD, the situation might be quite different. In the one case, the cost needed to, be viewed against generating an annual new fish flow of perhaps 80,000 tons per year. In the other case, it might be viewed as one aspect of increasing the fish yield of the Arabian Sea from 1 million tons per year to 10 million tons and the socio-economic effects of such an increase on the whole region.

Basic questions

Ranken (U.K.) referred to the Chairman's statement that developed countries would like to be told by developing countries what they wanted, but so often the people concerned in the developing countries did not know this themselves. All they could say was that they wanted to go into fishing. They had 5,000 km of coastline; therefore there must be plenty of fish, but what kinds and sizes? What fishing methods? What processing and distribution methods? What ports and their location, etc.? They did not know. They also would not know whether it was even worthwhile to start fishing. But who should they ask for advice? Certainly not the shipbuilders, processing plant or other manufacturers. All of these would sell them, perfectly honestly, excellent ships or equipment to do a certain job, but not necessarily the right ships or equipment to suit the customer's real requirements. These people certainly could not assess the viability and economic value of the overall fisheries operation They could not answer the vital questions:

(1) What was the size of the resource and its location and could it support a commercial fishery on a continuous basis or was it only seasonal?
(2) What type and size of ship was needed, and what methods of preservation should be used?
(3) What size of fleet and therefore of port was desirable and what facilities were needed?
(4) Where should the port be located on economic, political, sociological, as well as commercial grounds in relation to labour, distribution, transport, other industries, etc.?
(5) What scale of finance was likely to be needed, and where should this be obtained and how paid back?

Then, what equipment did they need to fulfil these requirements and who would manage and operate it?

What was needed was more organizations similar to that of Marchal's firm which could give an overall appraisal of the problems, translate this into a statement of requirements, then obtain reliable and realistic prices, assemble the necessary finance and present a trustworthy packaged deal to the customer, whether he be an individual, an organization, or a government. After carrying out the contract, they must also be prepared to manage it and train local personnel to take over. The key to success would always be the management at every level.

With regard to Chapman's contribution, having had personal experience in the Persian Gulf/Arabian Sea area, he wholeheartedly concurred in Chapman's assessment of the needs of the area. There were virtually no existing or potential fishing ports anywhere on the Arabian Peninsula; certainly there were none close to the resource, mainly in the Gulf of Muscat at the north-west corner of the Arabian Sea. The local village fisheries were therefore almost all beach fisheries but, even so, the seasonal catch in the Sultanate of Muscat and Oman alone was estimated as some 100,000 tons in 1947/8. The local fishermen ate what they needed and used some as fertilizer for the cultivation of date palms, the Muscat date having until recently been the major export from the Sultanate. The rest of the fish was sun-dried on the beach and what was left by the sand beetles was then exported inland by camel or abroad by sea, mainly to Ceylon. To expand this fishery would be a major operation, not only because of the lack of ports, but also because of the extreme climatic conditions, necessitating heavy expenditure on freezing and cold storage or other processing methods, quite apart from the many political, sociological and communications problems involved. The canning factory at Bandar Abbas (Iran), built in 1939 at the entrance to the Gulf, relied solely on a local primitive village fishery exploiting a large but strictly seasonal, and sometimes erratic resource. This factory has never been a success and had produced virtually no commercially saleable product, since you could not make an isolated village community into an industrial complex virtually overnight and, worse still, on a seasonal basis of such short duration.

SESSION II

Planning the Fishing Harbour at Tema, Ghana

by E. Loewy

Organisation du port de pêche de Tema, Ghana

L'auteur, après avoir décrit les types traditionnels de pêche pratiqués sur le littoral du Ghana, traite du dévelopment de l'industrie halieutique et de la première phase de la construction du port de Tema en 1959. Précisant les conditions auxquelles doit satisfaire l'organisation du nouveau port, il expose les incidences de celui-ci sur les pêches traditionnelles, notamment la disparition du village de pêcheurs. La première étape des travaux prévoyait l'établissement d'un plan d'eau abrité de 14 hectares (35 acres) comprenant une plage pour 200 pirogues et des jetées pour 30 bateaux à moteur et 6 petits chalutiers, avec 400 mètres de quai. Ce premier port a coûté £1 million ($E.-U. 2,4 millions).

Dès que l'on a su que les eaux de l'Afrique de l'Ouest renfermaient d'importantes ressources, des entreprises de pêche étrangères ont commencé à chercher des bases d'opération dans la région, et il a été proposé à maintes reprises d'agrandir Tema pour permettre une expansion de la pêche. Aussi a-t-on prolongé vers la mer d'environ 15 hectares (37 acres) le premier port, ce qui permet d'accueillir beaucoup plus de navires, et notamment de bâtiments armés à la pêche hauturière.

L'auteur mentionne la nécessité de planifier le développement des ports de pêche et traite de l'emploi de modèles hydrauliques lors de l'établissement des plans. Il décrit par le détail les brise-lames de Tema.

La communication poursuit en exposant des propositions ultérieures en vue de l'extension du port, ainsi que le ralentissement du développement en raison de la situation économique et de l'absence de personnel qualifié et expérimenté dans l'industrie halieutique. Elle conclut en signalant qu'il faut perfectionner la formation et l'organisation pour utiliser au mieux les installations matérielles extrêmement modernes actuelles du port.

El proyecto del puerto pesquero de Tema, Ghana

En este estudio el autor expone los tipos tradicionales de pesca de la costa de Ghana y hace una descripción general del desarrollo de la industria pesquera y de la construcción de la primera fase del puerto de Tema, en 1959. Indica las necesidades a las que habrá que hacer frente al proyectar el nuevo puerto y su repercusión en la pesca tradicional, incluída la desaparición de la traditional aldea de pescadores. La primera fase de la construcción abarcaba una superficie acuática protectora de 14 hectáres (35 acres), una playa para 200 canoas, y muelles con 400 m de muro para 30 embarcaciones con motor y seis arrastreros pesqueños. El costo de este puerto fue de un millón de libras esterlinas (2,4 millones de dólares).

A medida que se fueron conociendo los ricos recursos de las aguas del Africa Occidental, las organizaciones pesqueras extranjeras empezaron a buscar bases en la zona, haciéndose muchas propuestas para la ampliación del puerto de Tema de modo que se adaptara a esta expansión de las pesquerías. Dicho primer puerto se amplió hacia el mar en otras 15 hectáres (37 acres), lo que aumentó considerablemente su capacidad, en especial para embarcaciones de altura.

Indica el autor la necesidad de planificar el control de las obras portuarias y la del empleo de modelos hidráulicos al preparar los proyectos. Se da el diseño detallado del rompeolas.

Continúa el estudio con una descripción de las últimas propuestas para el desarrollo del puerto y señala el retraso que han sufrido las obras debido a circunstancias de tipo económico y a la falta de personal capacitado y experimentado en la industria pesquera. Termina llamando la atención con respecto a las necesidades de mejorar la capacitación y organización para aprovechar las modernísimas instalaciones materiales que actualmente existen en el puerto.

THE coast of West Africa has some most fascinating tropical sea fisheries, frequently carried on by methods which have not changed appreciably for hundreds of years. The Ghana coastline, a little over 500 km (310 miles) in length, lies mid-way along the east-west part of the great promontory constituting the western portion of Africa, and the new Port of Tema, with its associated fishing harbour, is within two kilometres of the Greenwich meridian, 0° East (fig 2).

Traditional fishing off West Africa can be divided into two main types: seine-net fishing from the beach, and drift-net, bottom-net and hook-and-line fishing from canoes. The canoes are traditional craft, paddled and sailed by quite a large crew and designed to be launched through the prevalent surf from open beaches. Many thousands of such canoes are in use and considerable skill in boat-building, navigation and fishing has been developed. Introduction of powered craft makes trawling possible, and this paper deals with the planning of the fishing harbour at Tema.

Early development

The recently-developed fisheries station at Takoradi, some 230 km (143 miles) west of Accra, and the covered market, was set up as a pilot scheme in 1960 with FAO advice and assistance. At about the same time two other similar stations were brought into operation, at Elmina 160 km (144 miles) west and at Tema, 30 km (19 miles) east of Accra. Like Takoradi, the Elmina station was designed to handle fresh fish from canoes and from 10 m (33 ft) long open motor boats and to serve existing communities. From the outset, Tema, was conceived on a more ambitious scale, with a greater depth of water alongside the quays, for discharging from small trawlers as well as from canoes and motor boats. Furthermore, since the whole of the Tema complex, main port, fish harbour, new town, and industrial area, was a complete entity newly created on the coastline bordering the undulating Accra Plains, there had to be built a comprehensive road and rail network to connect the harbours and town with the existing transportation system, and the full range of services such as electricity, telephone, fresh-water, sewerage and drainage needed in a modern urban area had to be provided.

In the early 1950's the Ghana Government decided to proceed with that part of the comprehensive project, recommended by the Consulting Engineers, Sir William Halcrow and Partners, in their report on the "Develop-

Fig. 1. Tema (Ghana) inner fishing harbour with, left to right, cold store, wholesale market, Fisheries Department office, covered boatyard and office and canoe basin. In the background can be seen the two Russian processing plant buildings in construction.

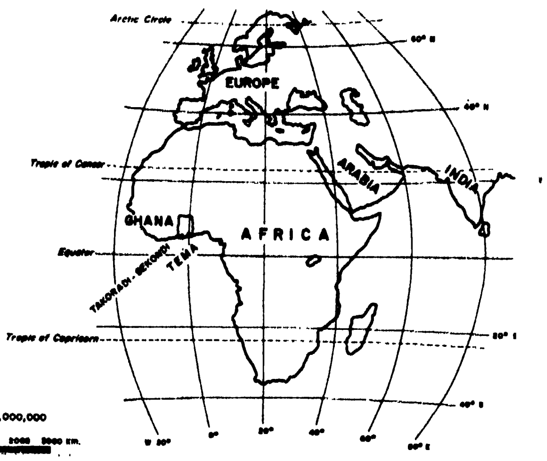


Fig. 2. Location of the Port of Tema, Ghana

ment of the Volta River Basin", calling for a new deep-water harbour at Tema. In addition to the selection of sites for the smelter and port needed by an aluminium industry based on hydro-electric power from the proposed dam to be built across the Volta, the Consultants also demonstrated the urgent need for new port facilities for the Accra capital city and metropolitan region and for the development of the whole eastern part of the country. At the port site, Tema, 17 miles east of Accra, there was a small traditional canoe-fishing community, and it was considered essential that port development, while obliterating the fishing beaches, should make proper provision for these fishermen. The new fishing harbour should however be designed to meet the growing Accra market and the expanding demands of the whole region and export trade by the development of modern shore facilities, processing plant and distribution networks supporting a fleet of modern vessels with well-trained crews.

The preliminary proposals

Tema fishing village has a population of about 3,000 people who owned some 100 canoes yielding an annual catch of about 200 to 300 tons which was sold through the market women locally and in Accra.

In 1950 the Fisheries Department of the Ministry of Agriculture was very small, but was staffed by some dedicated men. One of these had walked the whole length of the Ghana coastline noting numerous potential sites for fishing harbours, and had persuaded his Ministry to authorise construction of a boatyard in the disused harbour at Sekondi, 6 km (3.7 miles) east of Takoradi, where the Department could build 8 and 10 m (26.4 and 33 ft) long motor fishing boats. Some experiments were tried in fitting outboard motors to traditional canoes in order to travel out more quickly to the fishing grounds and return home, and fisheries stations were set up at the main beaches and harbours, with Department personnel to supervise the boxing, weighing and recording the catch and assist in the marketing.

FAO and the Fisheries Department carried out some joint experiments in 1957 with the introduction of fish flour processed for human consumption (FPC) to provide a means of countering the chronic deficiency of protein in the diet of the people in the northern parts of Ghana. These were very successful, and the report to the Ghana Government by Dr Francis Aylward, FAO, Rome, was enthusiastic about the quality of the meal produced by the experimental plant in the Accra Fisheries Station and at its reception by people in the North.

In the late 1950's, in conjunction with an American Company, surveys were undertaken along the coast to ascertain the fisheries resources in respect of species, seasons and techniques. It was found that tuna was plentiful in the middle waters, as well as herring, sole and snapper which have been traditional catches for the canoes.

The original conception for the Tema fish harbour was for the construction of simple jetties and shore areas within the main harbour at the root of the lee breakwater to serve some 20 motor boats. The investment would have been about £¼ million ($600,000) and the annual catch about 1,000 tons (including the canoe catch).

However, the Authority controlling the new port, the Railway and Harbours Department of the Ministry of Communications, vigorously resisted proposals for siting the fishing harbour within the main harbour on the score that fishing canoes and motor boats (and during the middle part of the year many hundreds of canoes used Tema while following the herring along the coast) would cause an intolerable interference with deep-sea vessels. This resistance was so effective that the Government agreed to the construction of a separate fishing harbour adjacent to the main harbour to be built at the same time, and it provided the necessary allotment of funds. This decision was of immense benefit.

INITIAL REQUIREMENTS

The Sekondi boatyard was gaining experience in the building and operation of various types of 10 m (33 ft) motor boat, and proving their suitability for fishing the inshore and middle waters of the Ghana seaboard. The Fisheries Department therefore decided that a larger yard should be constructed at Tema, capable of building 35 to 40 m (115 ft to 132 ft) trawlers and using the proven local timbers and imported steel. Such boats were a revolutionary change for the Ghana fisheries. They called for deeper wharves and channels, facilities for bunkering, watering, taking on ice and stores for departure, in addition to rapid handling of the catches. Allowing for a reasonable measure of expansion, the fishing harbour breakwaters were designed to enclose a protected water area of about 14 hectares (35 acres) and to accommodate a beach for some 200 canoes, and jetties for 30 motor boats and six small trawlers. With 400 m (436 yd) of quay wall and some limited dredging the harbour was expected to enable the annual catch to be increased to about 2,000 tons per year.

On land there was needed a market hall, plots for private fishing companies' developments, chandlers for nets and gear, a small cold store, oil bunkering tanks, and a Fisheries Department station. The old village of Tema would have to be demolished to make way for the new township and industrial area, and a new village built where the fishermen would have easy access to their new beaches. In the event it proved extremely difficult

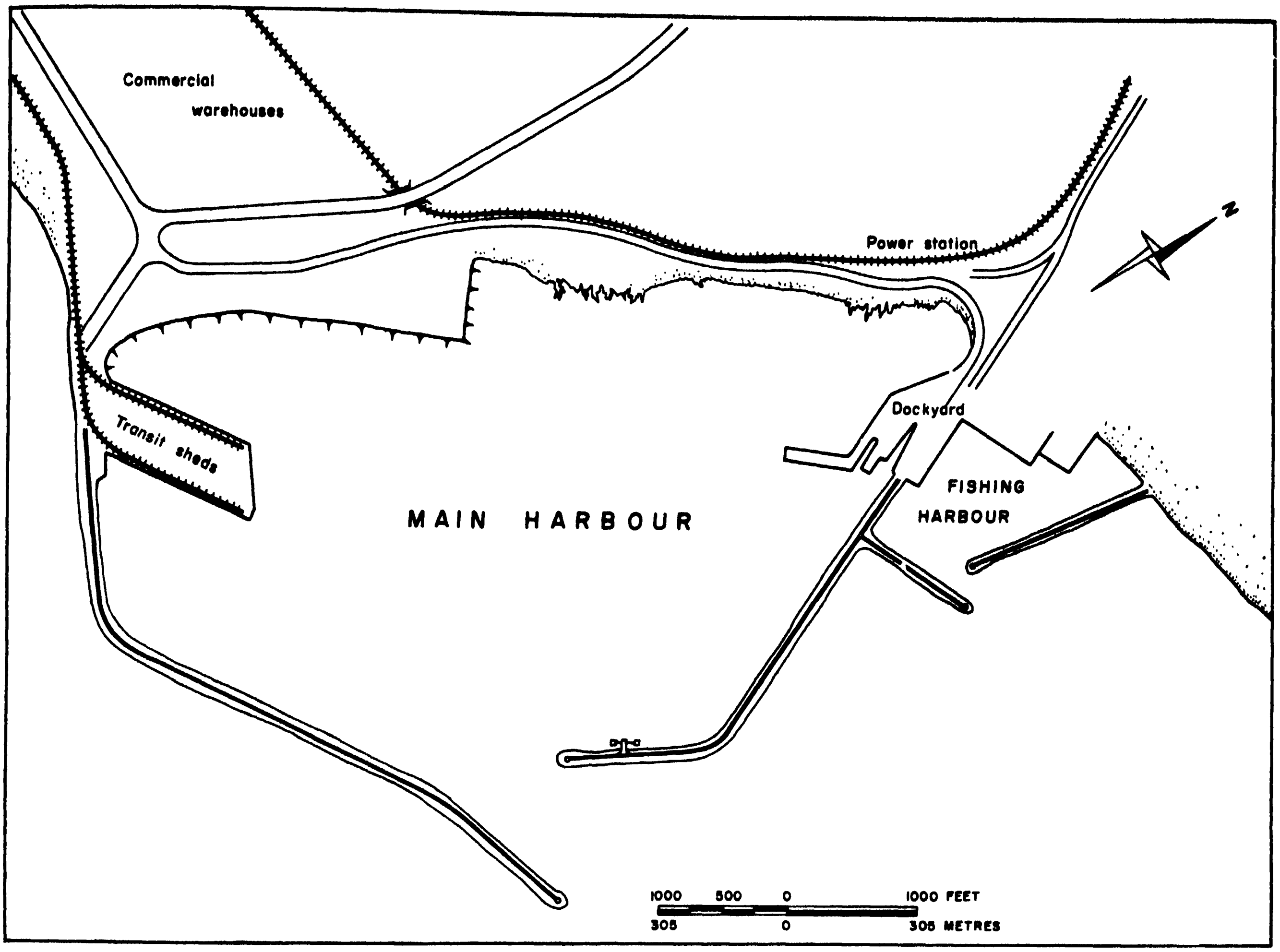


Fig. 3. Development of the fishing harbour at Tema, 1954

to persuade the local villagers to move into the fine new quarters which the Government had provided for them, and it was not until the Chief himself finally agreed to move (liberal compensation for each house had already been paid) that the bulldozers were able to move in and clear the old site. A picturesque if insanitary village was replaced by modern suburbia.

For ease of discharge, handling and transport a generous width of quay apron of 25 m (82.5 ft) was provided leading to a link road to the main port and town and thence to Accra. Some dredging for a canoe basin and for the trawlers was required, the canoe basin being formed in the sand bar separating the sea from the lagoon immediately inland. The spring tidal range is 1.6 m (5.2 ft), and the dredging was confined to deepening a shallow corner by the boat yard and one quay to about 4 m (13.2 ft) below Mean Low Water Springs for the trawlers, and to 1 m (3.3 ft) in the canoe basin.

The initial contract for the construction of the main port and fishing harbour was awarded in 1954, the whole work, so far as the latter was concerned, being completed five years later, the fish harbour having cost about £1 million ($2.4 million). Figure 3 shows the two harbours, with the fishing harbour in the lee of the main harbour, according to the design of 1954.

SURVEYS AND DEVELOPMENTS

The FAO fishmeal experiments and the fishery surveys along the Ghana coast caused the Government to look more closely at the prospect of gathering major food supplies from the sea. Prior to 1950, the annual sea catch was believed to have been about 20,000 tons. After the establishment of Fisheries Department stations along the coast and the weighing and recording of the annual catches, it was shown to have been about half as much again, of which almost all had been caught from the beach or by the 8,000 canoes of the fishing villages.

As the rich resources of the middle waters off West Africa became known, foreign fishing organizations began to seek bases from which to operate their catching fleets to export processed fish, Tema was already being developed, and by 1967 Russian and American companies and State Enterprises were putting forward proposals to enable them to make use of it in this way. In addition numerous orders for trawlers were being placed in foreign shipyards.

The Fisheries Department itself was seeking further to expand the harbour and the facilities, both seaward and landward. With the surge of Ghanaian new thinking and enthusiasm engendered by Independence, the Ministry of Agriculture decided to cater for the expanding fleet by putting in hand the extension of the harbour by a further 15 hectares (37 acres). This extension was to be seaward of the existing harbour, taking advantage of deeper water which would enable larger trawlers to enter and discharge along new quays. At the same time the North-South quay in the inner harbour was to be completed by building the remaining length of 950 m, with a finger quay and a motor boat jetty towards the inshore part to cater for the already-increasing number of motor boats and the tonnage of fish being landed. Figure 4 indicates the arrangements as built by 1965, showing the two harbours with their separate entrances.

The Consultants had earlier prepared, for the Fisheries Department a set of rules and advice for the guidance of those wishing to develop plots within the fishing harbour. By this means uncontrolled building and the erection of temporary shacks would, in principle, be avoided and the land area used in accordance with the harbour development plan to maintain efficient utilization at each stage. Developers were required to submit their proposals to the Department for approval before the lease was confirmed. These safeguards were unfortunately often evaded so that, at one stage, several unauthorised and unsuitable buildings had to be demolished.

The development of plots grew, both for fishing company offices and for cold stores, chandlers, canteens, and gear stores. The Ministry of Industries, through the Industrial Development Corporation, took over from the Fisheries Department, the operation of the boatyards at Tema and Sekondi, and a nationalized State Fishing Corporation was set up to take delivery of the trawlers and some of the motor boats, and to catch and distribute chilled and frozen fish. A project for a Russian cannery and fishmeal plant, associated with Russian trawlers, a floating workshop and carrier vessels, was proposed and some work was begun on site, and a large combined grain and fish processing plant in the main port was financed and constructed by a German firm, to make a wide variety of end products including canned sardines and fishmeal for fertiliser. One American Company exploiting the large tuna shoals arranged to use the Swiss-operated cold store for holding its catches to await subsequent trans-shipment.

By 1962 the aim was to catch 10,000 tons of fish per year, with a resident fleet of 12 trawlers, of size between 35 and 50 m (115.5 and 165 ft), 90 motor boats of 9 to 12 m (29.7 to 39.6 ft), and 200 canoes, many fitted with outboard motors. The further cost of the breakwaters, quays and services works was about £2 million ($4.8 million).

Investigation and analysis by means of hydraulic models had been undertaken by the Hydraulics Research

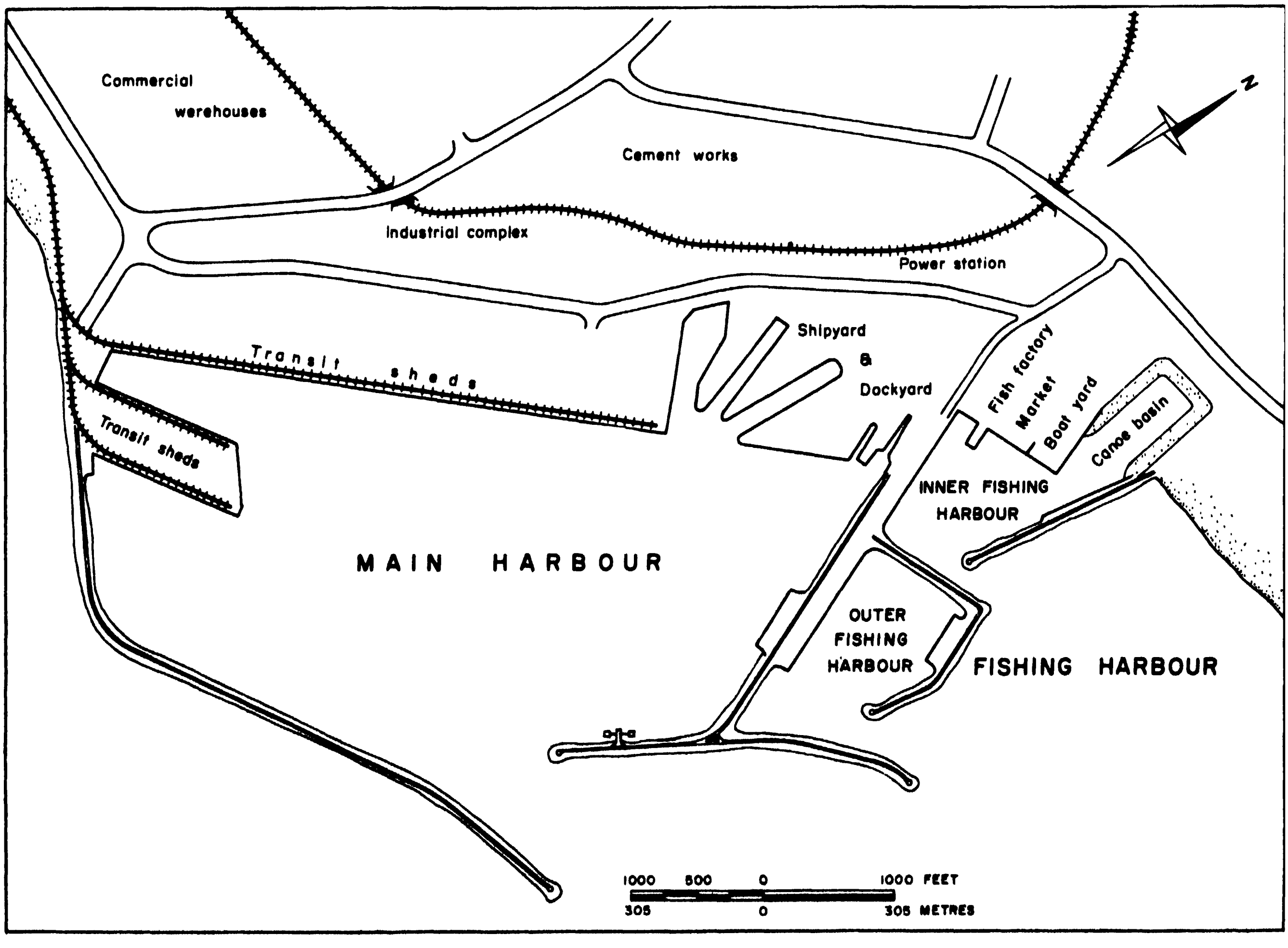


Fig. 4. Development of the fishing harbour at Tema, 1965

Station, Wallingford, for the original design of the Port of Tema. When seaward expansion of the fishing harbour was proposed, the Consultant arranged for further model tests at the Hydraulics Research Station, particularly to ensure that the expansion (fig 4) caused as little wave disturbance as possible to the main harbour entrance and to check that the configuration of the extension, the Outer Fishing Harbour, would provide satisfactory entry conditions and sufficiently calm water in the outer basin.

The detailed design of the armoured rock mound breakwaters was examined and finalized from such models, both for general stability and to avoid overtopping in face of the range of wave heights, periods and directions of approach that were considered possible from the instrument and visual records instituted at the beginning of Tema's construction in 1952.

Constructional design of the fishing harbour quay walls was developed from the more massive work entailed by the deep-water berths in the main harbour. Since the sea-bed was largely a dense massy rock, overlain by only a few centimetres of silt or sand, the Consultants evolved a wall design which made use of very large concrete blocks, precast on shore. The rock sea-bed was broken up and dredged, and in the trench so formed a level foundation of concrete was placed by divers working by touch in the murky water, with steel shuttering and plumb lines from a crane. Onto this bed were placed 12-ton blocks, built into a single thickness wall a little over 2 m (6.6 ft) thick, with a 3.7 m (12.2 ft) wide in-situ concrete capping. In deeper water further seaward the wall thickness was increased to 3 m (10 ft) for stability. This design, with the services pipes and cables embedded beneath the quay surface, proved to be very economical in cost and quick to build.

An earlier, silted-up, entrance to the lagoon behind the fishing harbour was unexpectedly found crossing the line of the quays in two places. In the shallower water the blockwork wall was used successfully, founded on a wide bed of tipped rock: in the deeper water a concrete-piled form of construction had to be employed, carrying a dock apron of reinforced concrete.

THE SEVEN-YEAR DEVELOPMENT PLAN

Tema fish harbour was thus growing rapidly but an even greater expansion resulted from a Government proposal to bring into Tema 180,000 tons of fish per year and turn it into one of the world's principal fishing harbours. Such a proposal was one of many similar schemes in the Seven-Year Development Plan for realization by 1970.

With publication of the Plan in 1963, fisheries in Ghana were to provide 250,000 tons of the badly-needed

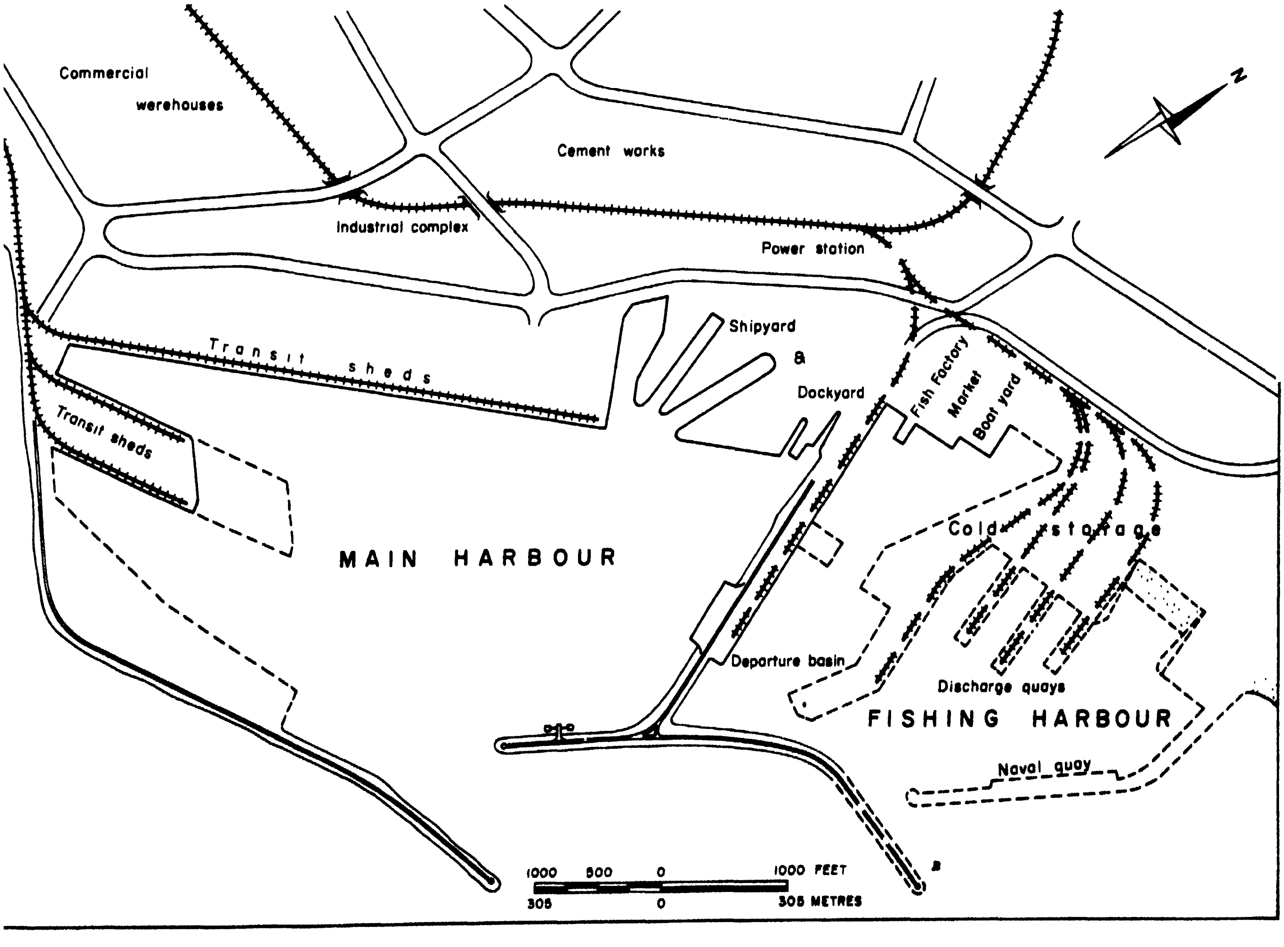


Fig. 5. Proposed layout for the fishing harbour at Tema for 1975.

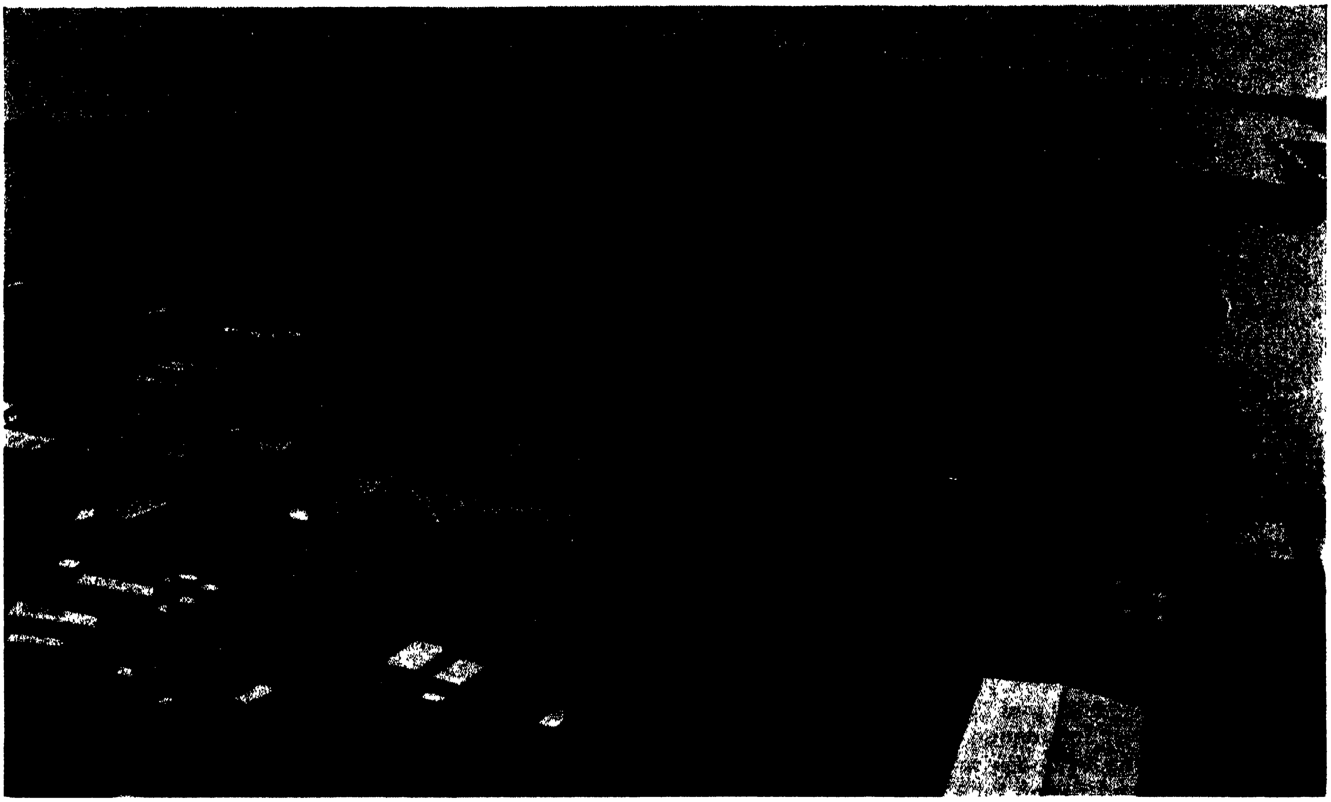


Fig. 6. The loading bays at the wholesale market at Tema. In the background can be seen the final stages of the building of the outer harbour, and beyond that the deceptively calm sea.

Fig. 7. Aerial view of the inner harbour with fishing company offices and fuel oil tanks on the lee breakwater of the main harbour in the background.

protein in the people's diet: uniformly distributed, this catch from the sea, lagoons and rivers would ensure the equivalent of 80 gm (2.8 oz) of fresh fish per person per day. Orders were placed overseas for over forty of the most modern trawlers and carrier vessels, of between 80 and 55 m length (264 ft and 181.5 ft), and for thirty trawlers of between 40 and 20 m (132 and 66 ft) length. The State Fishing Corporation was to run all but eighteen of these vessels, and it was intended that distribution of the quick-frozen catch would be by refrigerated lorries and rail vans.

It was a bold scheme, which should have benefited the country. However, it left many crucial details to be worked out between the Fisheries Department and the Fishing Corporation, and neglected to emphasize the need for trained men—in administration, in the many executive posts, in seamanship for the complex requirements of handling 1,500 and 2,000 gross registered ton trawlers, in the skilled trades required in the running of a large, modern fishing harbour and in marketing, transport and distribution.

At the same time the political situation was worsening. In increasing numbers of instances the Development Secretariat, working under the President, was countermanding instructions given by executive departments of the established Ministries: the Fisheries Department, with responsibility under the Plan for implementing the target of one-quarter million tons of fish per annum, was ordered to hand over a third of the potential quay length in the new outer fishing harbour for naval use.

At the Chief Fisheries Officer's request the Consultants prepared, in the early part of 1965, a report demonstrating that the harbour would have to be substantially further enlarged to deal with the increased fleet and catch. Improvements of living standards and a corresponding increase in population, provision for fishery protection or naval vessels and facilities for training fishermen in new methods, navigation, engine care and radio and radar technologies, all called for a larger harbour. Rapid distribution of the frozen catches by refrigerated or insulated railway wagons, loaded directly on the discharge quays and linked to the rail line built to Tema for the original contract, was planned as being the best and most economical way of handling fish in this context. A series of cold stores at the main railway stations would be served by refrigerated lorries to take the fish to the more remote centres. Fishmeal processing plants in the industrial area of the harbour would process the less valuable species and the seasonal surplus of fish and, depending on specification, would produce flour for human consumption or fishmeal fertilizer.

Figure 5 shows the proposed arrangement of the fishing harbour, with the east basin of 31 hectares (76.6 acres) in area, ample sites for cold stores and the rail-tracks on the fish quays, the separation of the main discharge and departure quays, and the provision of a quay for naval use clear of the trawler movements in the fishing harbour. The cost of these extensive works was estimated to be about £7 million ($16.8 million).

Early in 1966 the President was deposed, and it became apparent that there was no question of pursuing the aims of the Seven-Year Plan. The new National Liberation Council succeeded in cancelling orders for trawlers which had not been delivered, and rescheduling the term payments over a longer period of time for vessels and equipment received from overseas. A two-year stabilization programme was introduced to halt the increase in unemployment, emphasizing consolidation of what was already built or under construction in the fields of industry, agriculture and fisheries.

THE RECOVERY

Early in 1968 the Economic Affairs Commissioner said that the time was approaching to move from stabilization to modest development. The United Nations, through its Development Programme, is assisting in a five-year fishery survey along the West African coast which will investigate the catch yield from various methods of fishing in these waters and the improvement of freshwater fish resources in the lake behind the Volta Dam. A Norwegian firm has signed an agreement to operate, and train Ghanaians to operate, many of the large trawlers which have lain idle in the fishing harbour since being delivered; the Government in its turn is improving the shore facilities to handle and distribute the catch. There has been a gratifying resurgence of interest, stimulated by the more liberal approach of the Government, by private firms wishing to construct and operate cold stores, ice plants and supply fuel oil to the trawlers. Uncompleted processing factories are also being given a new appraisal to consider the best course for completion.

The "modest development" must of necessity be geared to what the country can afford. It is still too early to assess the rate at which expansion can take place in the next few years, particularly in the light of the relative reduction in international development aid. However, the physical assets—breakwaters, quays, roads, cold stores, wholesale market, the fishing fleet and the service installations are available to form the basis for a revived effort to exploit the resources as new sources of funds become available.

CONCLUSIONS

The Tema fishing harbour, after a most rapid and successful early period of development, is now in a transitional stage reflecting the country's efforts to stabilize its economy. The Fisheries Department, which is itself only some twenty years old has a most difficult task of consolidation and recovery. The fisheries targets of the old Seven-Year Development Plan were unrealistic and relied far too much on a proliferation of facilities, equipment, vessels etc., with insufficient regard for the needs for organizational structures, training, experience and management. Skilled executives, operatives and craftsmen are scarce in almost all the developing countries, and particularly so in a craft which is relatively new to these countries on a modern basis. Fishing has had a low social and economic status and this needs to be corrected. This is a subject to which Governments and the United Nations must give much more attention, in seeking to help developing countries to help themselves.

It is important to develop steadily on a broad front and not to allow one aspect to move too far ahead of the general progress. Otherwise some investments will lie unused or unfinished as is now the case at Tema fish harbour.

After the last two years of stringency and with Ghana's creditors viewing favourably her efforts to reach financial balance, there is every hope that the fishing harbour will become a working project on the lines which the Fisheries Department and the Consultants had planned. By some expatriate operation of trawlers, by the training of Ghanaians to take over their running, and by methodically building on each previous year's experience, there should become established at Tema a large-scale viable fishing industry of vital importance to the country.

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Some Aspects of Operations Research in the Planning of Fishing Harbours

by J. B. Madziar

Le role de la recherche operationnelle dans l'organisation des ports de pêche

Les pêches hauturières polonaises ont connu ces dernières années un vif essor, dont on s'attend à ce qu'il se poursuive pendant les 15 années à venir. Cette expansion a nécessité un développement considérable des installations des ports de pêche, et la communication étudie l'emploi des méthodes de la recherche opérationnelle dans l'organisation de ces ports.

Apres avoir passé en revue les catégories de navires et les fonctions des ports de pêche, l'auteur étudie la question de la capacité de production de ces ports, s'attachant notamment à l'application de la théorie des files d'attente pour évaluer les divers aspects du rapport entre arrivées des navires et installations d'accostage. L'important est que l'entrée au port des navires de pêche est un processus aléatoire exigeant pour la construction du modèle l'emploi de la théorie des probabilités. L'auteur expose les méthodes permettant de calculer la configuration des arrivées des navires de pêche et de l'utilisation des postes d'accostage.

L'existence de places à quai excédentaires est un gaspillage, et l'auteur explique comment déterminer la probabilité que des navires aient à attendre un poste de déchargement. Il critique les insuffisances des méthodes classiques employées pour estimer le nombre de postes d'accostage requis.

L'auteur examine ensuite les critères économiques de l'exploitation du port et de la flotte. Deux impératifs s'opposent: réduire le temps de "chômage" des navires et utiliser au maximum les postes à quai. Le critère optimal étant selon lui la minimisation des coûts communs port-flotte, il expose une méthode permettant de résoudre le problème. Dans la dernière partie du document, l'auteur étudie les aspects de l'exploitation des navires de pêche relevant du transport, et conclut que l'on s'oriente actuellement vers des navires plus grands et plus spécialisés, et notamment vers l'adoption du déchargement par "conteneurs". Après avoir comparé diverses méthodes, il conclut que le meilleur moyen d'assurer à l'avenir aux navires de pêche les services nécessaires sera de mettre en oeuvre un système d'accostage spécialisé et de plus grande capacité, assorti de l'adoption de procédés de manutention plus efficaces. Ce sont les méthodes de la recherche opérationnelle qui permettront le mieux d'organiser la mise en place de ces perfectionnements.

Aspectos de la investigación funcional en relación con el diseno de puertos pesqueros

En estos años las pesquerías polacas de alta mar se han ampliado grandemente y se tienen intenciones de que este desarrollo continúe en los 15 próximos años. Este crecimiento ha requerido considerables obras de mejora de las instalaciones y servicios portuarios pesqueros, y en este trabajo se examina el empleo de métodos de investigación funcional en la planificación de puertos pesqueros.

Después de tratar en primer lugar de las clases de barcos y las funciones de los puertos pesqueros, se examina la cuestión de la capacidad de movimiento del puerto, describiendo el autor detalladamente el empleo de la teoría de la fila de espera para estimar los distintos aspectos de las relaciones entre la llegada de las embarcaciones y los medios para el atraque. Característica importante de la situación es que la llegada de los barcos pesqueros constituye un proceso aleatorio que exige el empleo del cálculo de probabilidades al construir el modelo. Se describen métodos para calcular el régimen de llegada de los barcos pesqueros y el del empleo de las instalaciones de atraque.

El exceso de instalaciones de atraque constituye un despilfarro; el autor describe los métodos para calcular la probabilidad de que las embarcaciones tengan que esperar para descargar en los atracaderos. Critica las deficiencias de los métodos usuales para calcular el número de atracaderos necesarios.

En el trabajo se examinan a continuación los criterios económicos seguidos con respecto al funcionamiento del puerto y de la flota. Hay dos factores opuestos, a saber: la necesidad de reducir el tiempo muerto de las embarcaciones y la necesidad de obtener la utilización máxima de los atracaderos. El autor sugiere que el criterio óptimo es el de reducir al mínimo los costos conjuntos del puerto y de la flota, y describe un método para lograr esta solución. En la última sección el autor examina los aspectos del transporte en las operaciones de los barcos pesqueros y concluye que las tendencias actuales se orientan hacia la utilización de barcos mayores y más especializados y, sobre todo, adopción en las flotas pesqueras de grandes recipientes ("containers") para efectuar la descarga. Se comparan distintos procedimientos de operación, y el autor llega a la conclusión de que el mejor método para atender a las embarcaciones pesqueras consistirá en disponer de un sistema especializado de atraque de mayor capacidad, con la introducción de planes de manipulación más eficientes. Como mejor pueden planearse estas instalaciones y servicios es mediante la aplicación de métodos de investigación funcional.

THE sea fishing industry is still developing in Poland. The catches in 1967 were over 300,000 tons and target figures for 1980 to 1985 are about one million tons. This is connected with the ever growing exploitation of ocean fishing grounds and the operation of ever bigger industrial fishing vessels.

Ships

The characteristics of the industrial fishing vessels built and in service in Poland with price indices are in Table 1. It is evident that each type of fishing vessel presents a special operating problem and its adequate solution gives the proper economic results. The stay of the ship in port, during which it is serviced, is a very important link in the service cycle of the fishing vessel.

Ports

To provide good and regular service to the fishing vessels in Polish fishing harbours special berths were designed, capable of servicing large industrial fishing vessels. The schemes of these berths are given in Figs. 1 to 3.

Each scheme presents a separate technical solution of the problem and, as is to be expected, the achieved results in servicing the ships differ. The problem of

TABLE 1. POLISH INDUSTRIAL FISHING VESSELS CHARACTERISTICS

Lp.			B-20	B-23	B-18	B-15	B-22	B-67
1.	Length	m	61.55	69.23	87.25	83.00	88	164
2.	Breadth	m	9.80	11.00	14.14	13.80	14.50	21.3
3.	Draught	m	4.41	5.05	5.36	5.50	5.25	7.8
4.	Range	days	45	50	75	70	90	80
5.	Speed	knots	12.8	14.0	13.8	12.5	13	15.5
6.	Crew	men	31–33	37–42	74–82	93–103	90–103	248
7.	Hold's capacity	m^3	500	610	1,680	1,750	1,920	10,100
8.	Type	—	stern trawler tr. ruf.		stern trawler tr. ruf.		tr. ruf.	mother ship
9.	Price index	%	100	175	345	300	385	970

defining the turnover capacity of the berths while designing those installations arose, and as quite new types of ships were to be serviced there, this problem was rather difficult to solve.

Turnover capacity of the fishing port

Several types of industrial fishing vessels are in service in the Polish fishing industry now, and comparison of the achieved results with the planning data, and the formulation of proper recommendations for the future, was a serious problem. The operations research method was considered most suitable for this purpose in a scheme adapted for commercial ports in a very comprehensive form by G. Schultze. This paper gives examples of adjustment of this method for fishing ports servicing large fishing vessels. The operation of these ports differs from the commercial ports pattern.

Port definition

The classic definition of a port, which includes a fishing harbour, states that the port is the area sheltered from the sea, in which ships can be protected, and in which they can be serviced, especially loaded and discharged. From this definition the following main problems arises:

(a) The problem of creating the conditions in which the ship can be protected against the activity of the sea.

(b) The problem of creating the conditions for efficient loading and discharging, i.e. to make

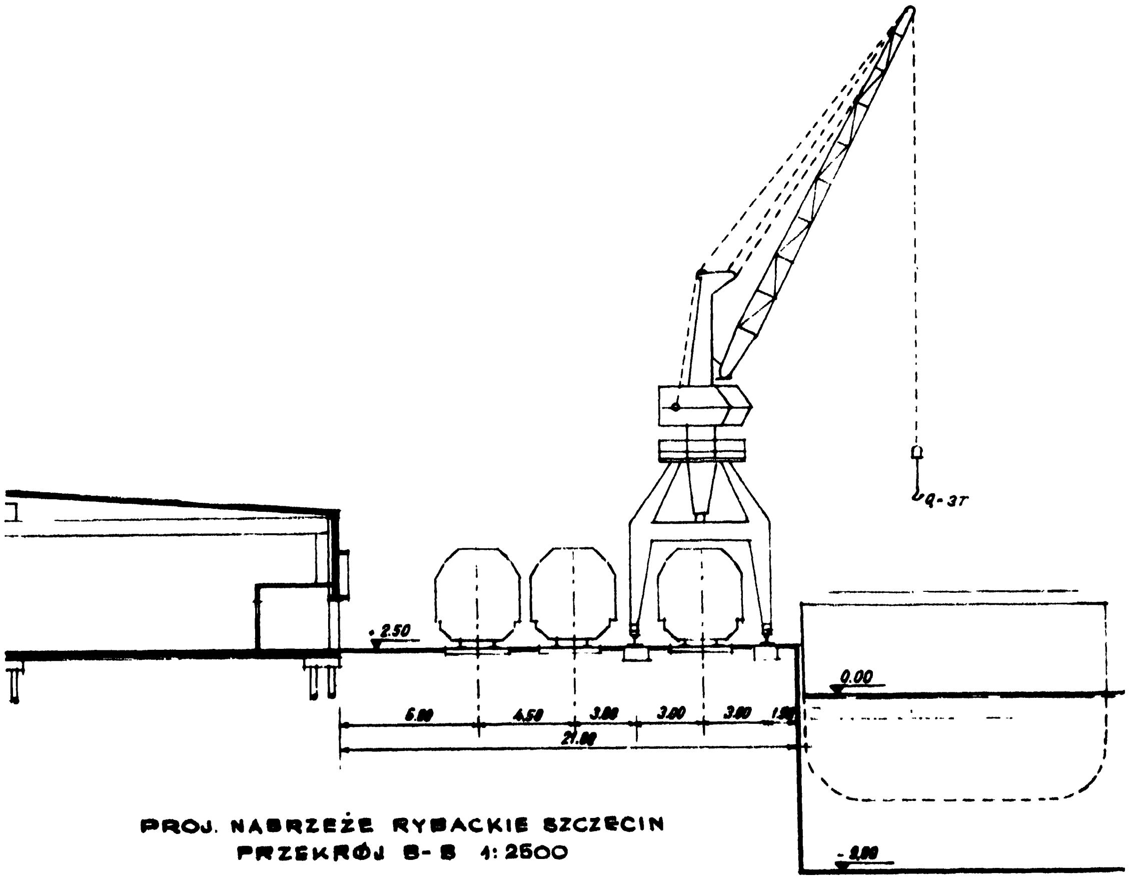

Fig 1. Berths on Bulgarskie Quay in Szezecin, now under construction

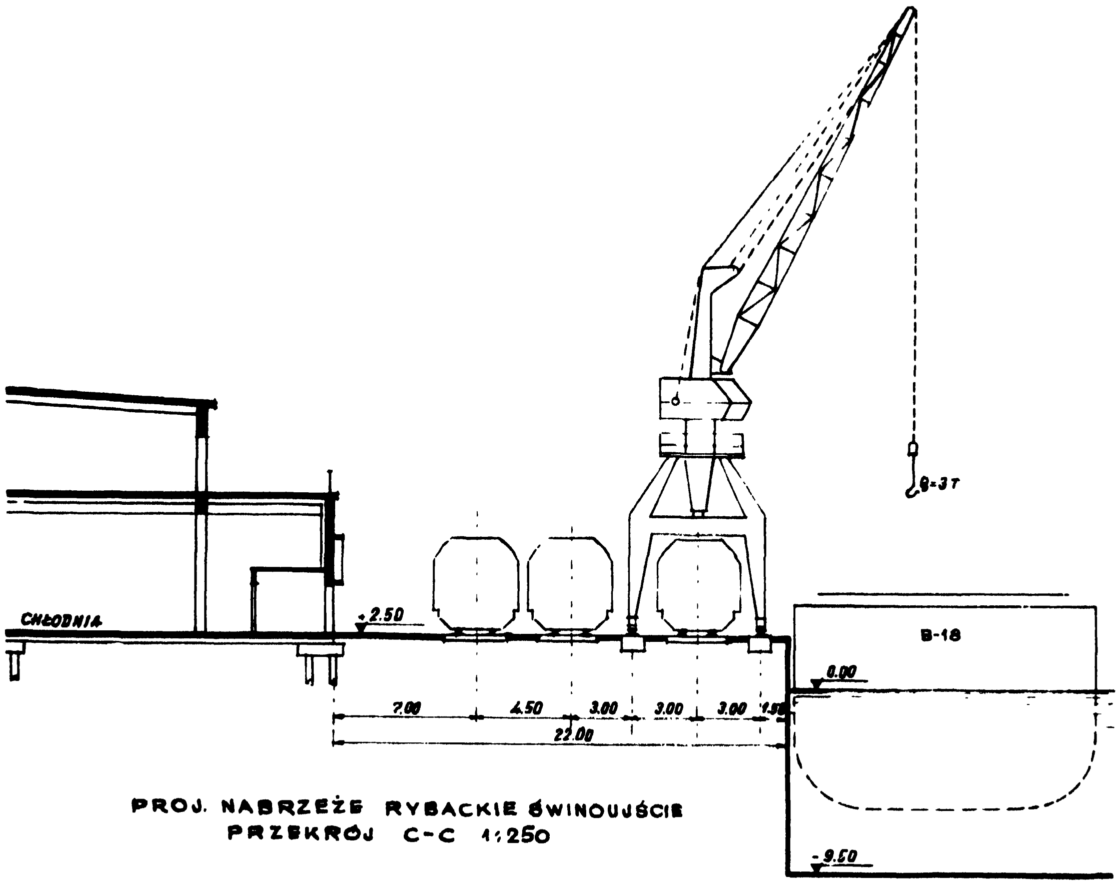

Fig 2. A proposal for discharging and loading quay in No. 2 basin in Fishing Base in Swinoujście.

the port an efficient link in the transport chain. Solution of this problem makes evident not only the problem of the servicing of the ship, but the problem of the other means of inland transport acting in the port. The port should assure proper handling for all means of transport using the port.

From the economic point of view the fishing port is the complex of installations on land, organized to service the fishing fleet and its cargo, and is the main link in the production chain of all components of the fishing industry, which should efficiently perform their tasks, with the aim of achieving the planned targets with the minimum of cost.

This definition formulates the problem of port planning in such a way that the planned results should be optimum, that is, the results of all components should minimize total costs.

In this paper the problem of the existing servicing relations between the port and the fishing vessel is dealt with. The service of the industrial fishing vessel in the port is a non-continuous process, in general cyclic, in which the exact time of the ship's arrival in the port, as well as the exact time of the end of the service cannot be predicted. Using the principles of the probability calculus, we can predict the probability frequency of these occurrences.

Such processes are described by queuing theory and the received results of calculations according to this theory conform with reality in such a way that they can be used in the practice of port planning. The problem of fishing port planning is the problem of decision-making in conditions of uncertainty.

SOME THEORETICAL PROBLEMS IN BUILDING THE MATHEMATICAL MODEL OF THE FISHING VESSEL SERVICE IN THE PORT

In the following chapters the symbols used are as follows:

$X(t)$	random function defining the number of arrivals in the period of time $(0, t)$
$F(x)$	cumulative distribution function
t	period of time or unit of time
k	number of arrivals (number of observations)
$p_k(t)$	probability of k arrivals (observations) in the period t
$P_0(t)$	probability that the arrivals (observations) are null in the period t
$\lambda = Nt/Z$	average rate of arrivals
N	number of arrivals in the observed period of time
Z	number of units of time in the observed period of time
V	service time
$\bar{V}$	average service time
$p_s(t)$	probability that the service time is t
$\mu = 1/\bar{V}$	average rate of service

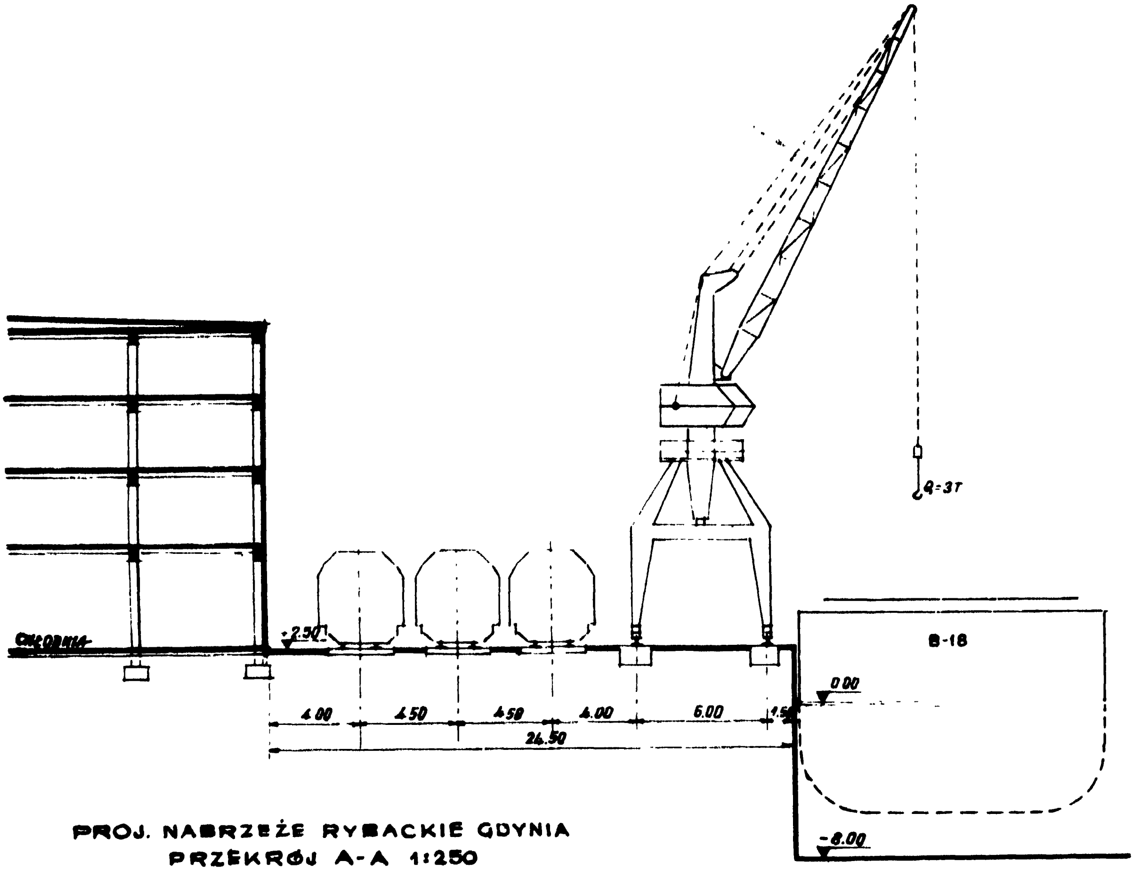

Fig 3. An adaption proposal for Angielskie Quay in Gdynia.

t_p	average waiting time of the ship—the time in the queue
s	the number of berths in the port
n_s	the average number of waiting ships
τ	the idling coefficient of the berth

Assumptions and definitions

The complex of fishing vessel and port can be considered as one of the schemes of queuing theory, the berth corresponding with the operating unit.

The process of arrival of the ships is a stochastic process, the moment of each arrival and the number of the arrivals in a definite period of time are random variables, that is, their value is defined by random circumstances.

The stream of arrivals is described by function $X(t)$ defining the number of arrivals needing service in the period of time $(0, t)$. This function is a random function for each t.

Analysing the actual descriptions of arrivals we find that the results in each experiment are, as a rule, not the same. Those descriptions are not the random functions—they are the realizations of the function $X(t)$ in each experiment.

The full characteristic of the random variable gives its cumulative probability distribution. It is the function $F(x)$ describing the probability that $X < x$, where x is any number; that is, $F(x) = P/X < x$, where $P/X < x$ is the probability that $X < x$.

We can assume in practice that the stream of arrivals of the ships to the port is the simplest stream, that is, it is stationary, simple and with no consequences.

The stream is stationary when the probability of a definite number of arrivals in a definite period of time does not depend on the moment of time in which we start counting, but on the length of the period only. It means, that the probability in the period $(0, t)$ occurs exactly k arrivals, is equal to the probability of the same number of arrivals in the period $(a, a+t)$ where a can be of any value.

The stream is simple when at any definite moment only one arrival can happen.

The stream is with no consequences, when one arrival does not change the pattern of the following arrivals.

In a definite period of time t the sum of probabilities of all possible arrivals and the lack of arrivals is equal to unity, that is

$$\sum_{k=0}^{\infty} p_k(t) = 1.$$

If we define the probability of no arrivals as $p_0(t)$ then

$$1 - p_0(t) = \sum_{k=1}^{\infty} p_k(t) = p_z(t).$$

Function $p_z(t)$ is the probability that during the period t in the servicing system (the port) at least one arrival happens.

For any stationary stream of arrivals there exists the limit

$$\lim_{t \to 0} \frac{p_z(t)}{t} = \lambda.$$

The quantity λ is called the average rate of arrivals. This parameter is equal to the average number of arrivals in the unit of time.

For the simplest stream the probability of k arrivals in the period t conforms with the Poisson distribution.

$$p_k(t) = \frac{(\lambda t)^k}{k!} \varepsilon^{-\lambda t} \qquad k = 0, 1, 2 \ldots .$$

The simplest stream is fully described by the system of these functions. If t is an equal unit of time then the system depends on the average rate of arrivals. Quantity $p_k(t)$ is the probability of exactly k arrivals in the period $(0, t)$.

Arrivals of the ships in the port and their distribution in time

The adoption of the Poisson formula solves the problem of forecasting the number of ship arrivals in the port during a definite period of time, for example during one day. Applying the rules of the probability calculus, the probability of k arrivals of the ships during the period t when we know the total of the arrivals N during Z number of t periods is defined by the Bernoulli formula

$$p_k(t) = \binom{N}{k} \left(\frac{t}{Z}\right)^k \left(1 - \frac{t}{Z}\right)^{N-k}.$$

When the number Z of t periods is large, and a large number of N is observed, this formula changes to the Poisson formula

$$\left[p_k(t) = \frac{\left(\frac{Nt}{Z}\right)^k}{k!} \cdot e^{-Nt/Z} \right].$$

Substituting $Nt/Z = \lambda$ we obtain the previous formula. It is more convenient in port planning calculations to adopt as a unit of time the average berth service time. Then the number of arrivals during this period allow us to evaluate the likelihood of congestion. If the probability of k arrivals in unit t is multiplied by the number of observed units, the frequency of k arrivals is obtained.

$$Z_k = p_k(t) . Z.$$

To prove the confirmity of the results obtained in the theoretical way with the reality, the calculations for the fishing port of Gdynia, where the industrial fishing trawlers B-15 type are serviced, were performed. The results of the comparison were satisfactory.

The berth service time

The berth service time in the port is defined as the period of time between the arrival of the ship in the port and her departure. This time varies around average service time. The table of such service times for a certain year is given in Table 2.

Service time is a random variable and can be described by a cumulative probability distribution. If we describe service time as v then

$$F(t) = P(V < t). \qquad t \geqslant 0$$

$F(t)$ is the probability that service time is less than a certain, defined t.

Applying Pearson's test we receive

$$x^2 = 0.05; \quad 1 = 3.8; \quad x^2 = 0.158.$$

In practical calculations, the negative exponential distribution is assumed. The real service times of the ships differ from this theoretical distribution. The cumulative probability distribution of service times is described by the formula

$$F/t/ = i - \varepsilon^{-\mu t}$$

where $\mu = 1/V$ is the rate of servicing. If the service times distribution does not follow the simple negative exponential curve sufficiently well, one of the so-called K curves should be adopted. These theoretical curves are plotted on assumption, that the service time is split in several phases, following one another, and that the ship does not leave the berth until all phases are completed. K is the number of phases, each of which has a negative exponential distribution. With increasing K the servicing times become more uniform till $K = \infty$ when all service times are the same. In general, the probability $p_s(t)$ of given service time $t < x$ is described by the

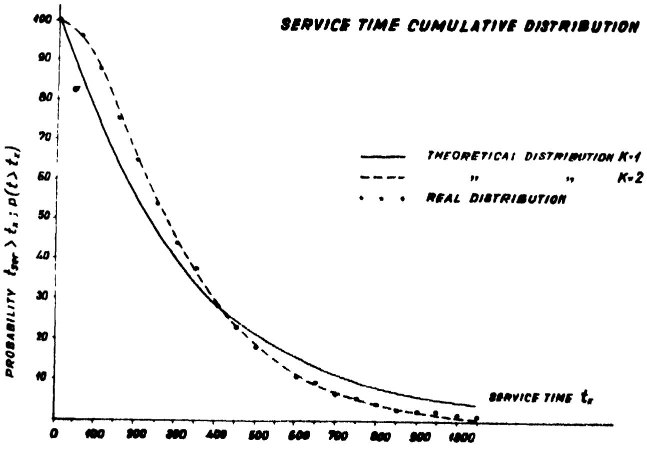

Fig. 4.

TABLE 2. ARRIVALS DISTRIBUTION OF B-15 TRAWLERS IN GDYNIA HARBOUR IN 1967

k	$k!$	λ^k	$\frac{\lambda^k}{k!}$	$\frac{\lambda^k}{k!} \varepsilon^{-\lambda}$	$\frac{\lambda^k}{k!} \varepsilon^{-\lambda} Z = np_i$	Real distrib.	$mi-npi$	$(mi-npi)^2$	$\frac{(mi-npi)^2}{npi}$
0	1	1	1	0.817	298	298	0	0	0.000
1	1	0.202	0.202	0.165	61	60	−1	1	0.016
2	2	0.0408	0.0204	0.0168	6	7	+1	1	0.142
Total				0.9988	365	365	0		0.158

formula

$$p_s(t) = \sum_{n=0}^{k-1} \frac{(k\mu t)^n}{n!} \varepsilon^{-k\mu t}$$

when $K = 1$

$$p_s(t) = \varepsilon^{-\mu t}$$

when $K = 2$

$$p_s(t) = \varepsilon^{-2\mu t(1+2\mu t)}$$

The curves are shown on fig 4.

TABLE 3. SERVICE TIMES OF B-15 TRAWLERS IN GDYNIA HARBOUR IN 1967

No.	Service time	No.	Service time	No.	Service time	No.	Service time
1	350	20	318	39	102	58	288
2	147	21	156	40	312	59	162
3	875	22	438	41	258	60	120
4	174	23	144	42	162	61	246
5	174	24	132	43	398	62	402
6	184	25	216	44	390	63	204
7	258	26	132	45	234	64	458
8	96	27	492	46	348	65	144
9	456	28	468	47	396	66	432
10	210	29	360	48	1,032	67	372
11	708	30	138	49	426	68	168
12	852	31	702	50	216	69	508
13	306	32	708	51	312	70	384
14	228	33	432	52	456	71	192
15	408	34	258	53	432	72	528
16	444	35	348	54	162	73	288
17	228	36	326	55	348	74	318
18	54	37	372	56	366		
19	294	38	288	57	342		

In reality during servicing the fishing vessel in the port there are several phases to be distinguished. The analysis of the servicing time of some B-15 type vessels in Gdynia fishing harbour is given in Table 4.

All these activities are not executed in sequence, but partly simultaneously. In the sample, the corresponding coefficient is 1.67, that means, that effective service time was on average 188 h. This complicated service system explains the conformity of the service time distribution with the theoretical multiphase service time distribution with $k = 2$.

TABLE 4. ANALYSIS OF THE AVERAGE SERVICE TIME OF THE B-15 SHIPS IN GDYNIA FISHING HARBOUR IN 1965—SAMPLE OF ARRIVALS

	Hours	%
1. Customs, migration, health	2	0.5
2. Unloading	52	12.9
2.1 Fish	42	10.4
2.2 Fishmeal	10	2.5
3. Loading	51	12.6
3.1 Packaging	11	2.7
3.2 Technical outfit and gear	14	3.5
3.3 Food	20	5.0
4. Water	37	9.2
5. Fuel	14	3.5
6. Cleaning of the holds	10	2.5
7. Repairs	130	32.2
8. Towing and shifting	2	0.5
9. Departure and others	8	2.0
Total	403	100.0

Waiting line and waiting time

As arrivals and service time are random occurrences waiting lines of ships form in the ports in spite of the efforts of port managements and shipowners. The length of the waiting line and the waiting time of the ships depends on the average rate of arrivals and the average rate of servicing. If by $\bar{n}$ is defined the average number of ships present in the port (being serviced and waiting for the service) and $\bar{n}_s$ is the average number of the ships waiting for the service, then if the port is equipped with s berths the following relation can be written

$$\bar{n}_s = \bar{n} - s + \bar{S}_0$$

where $\bar{s}_0$ is the average number of idling berths. Analysing the possible states of the system (the port) and analysing the number of ships in the port, assuming that the system is stable, all possibilities can be described in the following set of equations:

$$\lambda p_0 = \mu p_1$$

$$(\lambda + n\mu)p_n = \lambda p_{n-1} + (n+1)\mu p_{n+1}; \quad 1 \leqslant n < s$$

$$(\lambda + s\mu)p_n = \lambda p_{n-1} + s\mu p_{n+1}; \quad n \geqslant s$$

whose solution is:

$$p_n = \frac{p_0\left(\frac{\lambda}{\mu}\right)^n}{n!}; \quad 1 \leqslant n < s$$

$$p_n = \frac{p_0\left(\frac{\lambda}{\mu}\right)^n}{s!\,s^{n-s}}; \quad n \geqslant s$$

Where p_0 = the probability, that in the system (port) there are no ships. Then p_0, $\bar{n}_s$ and t_p are described by the formulas:

$$p_0 = \frac{1}{\sum_{n=0}^{s-1} \frac{\left(\frac{\lambda}{\mu}\right)^n}{n} + \frac{\left(\frac{\lambda}{\mu}\right)^s}{s!}\left(1 + \frac{\lambda}{s\mu}\right)};$$

$$\bar{n}_s = \frac{p_0\left(\frac{\lambda}{\mu}\right)^s \frac{\lambda}{s\mu}}{s!\left(1 - \frac{\lambda}{s\mu}\right)^2}; \qquad t_p = \frac{p_0 s\mu\left(\frac{\lambda}{\mu}\right)^s}{\left(1 - \frac{\lambda}{\mu}\right)^2 s!}$$

Verification of the hypothesis

The results of the trial must be compared with the theoretical forecast, and if they conform, the hypothesis is valid. The proper statistical procedure for this comparison is the Pearson χ^2 (Chi-Squared) test. This test indicates the extent to which the differences between the theoretical and empirical results can be regarded as random, non-significant variation, and can establish that, with a given degree of probability, the results are the same. The empirical data given in this paper was tested in this way for goodness of fit and found to be significant.

METHODS OF DEFINING THE NEEDED NUMBER OF BERTHS IN THE FISHING PORT

By conventional methods the number of needed berths and in this way the length of the quay, or the expected traffic result when the number of berths is given, are obtained assuming a deterministic pattern of fishing cycle, and in this, a determined service time in the port. Sometimes, without respect to the real service time, a normative time of the stay of the fishing vessel in the port is assumed with different motivations, as for instance the recreation of the crew.

As the full utilization of the berth was to be assumed, the definition of the annual average number of ships in the port in one day was introduced and the following formula was applied:

$$\bar{n}_s = \frac{N_s . t_p . i}{T - T_r}$$

where N_s = number of arrivals during one year of one fishing vessel,
t_p = assumed average number of days of the stay of the fishing vessel in the port,
i = number of vessels registered in the port,
T = total ship time per annum,
T_r = time of repairs of the ship.

As, in reality, the service cycle of the ship and the port has a random pattern, the full utilization of the berth could not be assumed. Therefore the coefficient of irregularity was introduced, and in this way the maximum number of ships to be serviced in the port was defined. In the same way the turnover capacity of the berth was defined and the applied formula is:

$$q_m = \frac{720 . D . \alpha . K_m . k_w}{t_z + t_r + t_w + t_n}$$

where 720 = number of working hours in a month
q_m = monthly turnover capacity of the berth
D = average hold capacity
α = coefficient of utilization of the hold capacity
k_m = meteorological conditions coefficient
k_w = coefficient of utilization of the berth by the ships
t_z = time of loading and discharging of the ship
t_r = time of repairs of the ship
t_w = other servicing times of the ship
t_n = unclassified time of the ship

By multiplication the total turnover capacity of all berths in the port is fixed.

The capacity of the other elements of the port layout in the conventional method of planning are defined by formulas of the same character—including coolhouses, stores and even workshops.

Deficiency of the conventional method

As mentioned, these methods disregard the real random pattern of the arrivals of the ships to the port and the time of service in the port. The essential deficiency of this method is based on the fact that the scheme of computing does not include the influence of the port capacity on the economics of the ships, that is the waiting time of the ships is not analysed. The significance of this influence can easily be understood, as the investment ratio for the ship of B-15 size and corresponding berth in Polish conditions can be fixed as 7:1.

Method of joint minimum of costs of the fishing fleet and the port

In commercial harbours the controversy between the ship and the port is easily to be found—the shipowner asks the quickest possible service for his ship, disregarding the number of ships present in the port. On the contrary, the port interest lays in full utilization of the berth's capacity, which is conducive to the idling of the waiting ships. The need for compromise is self-evident, if only such a compromise can be formulated.

In fishing harbour conditions, especially where the fishing enterprise includes the fleet and the port, this controversy is not so acute.

It is even to be understood more easily, as a criterion of joint minimum of costs for the fishing fleet and the port. This criterion, using queuing theory, is easy to formulate. The queuing theory can be applied, as the results of the calculations showed that the process of arrivals of the ships in the fishing harbour has a random pattern, and the service time in the port can be described by the negative exponential function. Different servicing systems can be described by this theory. Considering the fishing harbour, the scheme with obligatory waiting can be applied—the arrival coming to the system can leave it only when it is fully serviced. The waiting line forms, when all berths (servicing apparatuses) are occupied. The facilities can be combined in parallel or in sequence, i.e. the berths are universal or specialized—loading, repairing, bunkering). In this paper, only the parallel scheme is discussed. The specific feature of the fishing harbours is that the number of ships present in the port cannot exceed the definite number—if the port services only its own fleet, of the total number of ships registered in the port. Nevertheless, for the sake of comparison with the commercial ports the scheme with unlimited number of arrivals was considered.

Defining the optimum number of berths in the port

Service time in the port is assumed, to simplify the case, for $K = 1$, as it was said before, by formula:

$$\lambda p = \frac{1}{\mu s - \lambda} \frac{\frac{1}{s!}\left(\frac{\lambda}{\mu}\right)^s \varepsilon^{-\lambda/\mu}}{\frac{1}{s!}\left(\frac{\lambda}{\mu}\right)^s \varepsilon^{-\lambda/\mu} + \left(1 - \frac{\lambda}{\mu s} \sum_{n=0}^{s-1} \frac{1}{n!}\left(\frac{\lambda}{\mu}\right)^n\right) \varepsilon^{-\lambda/\mu}}$$

The average waiting line (number of ships waiting for the service) is:

$$\bar{n}_s = \mu t_p.$$

The average waiting (idling) time for the berth is:

$$\tau = 1 - \frac{\lambda}{\mu s}.$$

λ/μ is average number of ships arriving in the port during the average service time.

So, knowing N, Z, $\bar{v}$ and assuming Poisson's distribution of arrivals of the ships in the port and the negative exponential distribution of service times, many interesting conclusions on port operations can be reached.

The objective function for decision making is:

$$K_0 = K_p + K_f$$

where K_0 = the total costs of delays of ships and idle time of the port

K_p = idling costs of the port

K_f = waiting costs of the fleet.

The minimum of this function is the solution sought. The calculations are carried out in such a way that the minimum number of berths in computations is assumed to be rounded λ/μ and the calculations for following numbers are continued until the minimum is disclosed.

The results of such computations are presented in fig 5.

The above solution is the partial solution of the general transportation problem of the fishing industry.

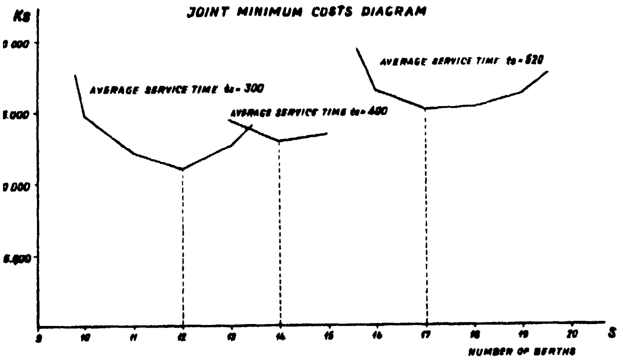

Fig. 5.

TRANSPORTATION TASKS OF THE FISHING INDUSTRY

To be fully aware of this problem, the transport scheme in deep sea fishing is to be considered. Big autonomous fishing vessels perform all the functions of fishing industry and transport, covering catching on the fishing grounds, transport to, and discharge in the port. It was soon found, while analysing the autonomous fishing vessels cycle, that better results would be obtained, if the ships, instead of being general purpose, were specialized, that is, special ships for catching, for processing and for storing, and transport would be introduced into the service. This led to the following schemes while planning ocean fishing:

(a) Expeditionary catches—the whole fleet with the mother ship returns to the port.

(b) Expeditionary catches—the mother ship is the permanent base, and fish is transported to the port by specialized transport ships. The latter seems to be better from the port's point of view.

Each of these schemes, as different ship characteristics are involved, has different implications for the port's layout and management. The results are to be observed in two ways, in the dimensions of the basic port installations, i.e. channels, breakwaters and wharves, and secondarily, in the storage capacity of the port.

The most efficient system

This problem of storage, observed always where a non-continuous transport process is applied, and where elements of the transport chain with different characteristics are interconnected, is to be observed in the independent fishing vessels working cycle scheme too, and forms a part of the criterion function equation.

For the most developed scheme, i.e. most specialized, and therefore where the best results are to be expected, the working scheme is as follows:

(a) Catcher—fishes with maximum utilization of the fishing gear and installations, quick transport to the mother ship for discharge and quick return to the fishing ground—the cycle is then repeated. Of course, the cycle is influenced by random phenomena and this factor must be introduced into the computations.

(b) Mother ship—quick dispatch of catchers, processing of fish with full utilization of processing installations and quick dispatch of refrigerated transport ships. The non-continuous pattern of arrivals of catchers and transport ships, and the demand of continuous throughput of processing installations, calls for retention stores. Their capacity can be calculated on an operations research basis.

(c) Refrigerated transport ship—her cycle characteristics are similar to the cargo ship and the economic criteria are the same. It implies quick dispatch at the mother ship and in the port and quick transport between them. If we assume a proportional and continuous performance of the inland transport system, storage capacity in the port is necessary. This retention capacity is defined by the size of the ships, number of their arrivals and random occurrences.

Economies of scale

The economic calculus shows clearly, that the transportation cost of one ton of cargo decreases with increasing size of the ship, and in the same way the cost of the ship is decreasing. To utilize this effect, the ship must be serviced in the port properly and the speed of dispatch must increase with the size of the ship. This demand influences the port costs—the size of basic port installations must increase and the number and capacity of the handling must increase too. It is connected with adopting more efficient handling techniques. The container system is considered to be most efficient, and introduction of the container can revolutionize fishing vessel design, fishing ports and distribution schemes. The container system is advanced in the merchant fleet, and introduction of this system into the fishing industry is to be expected.

It seems that the future fishing vessel would be best serviced on the specialized berth properly designed and equipped. Such berth's régime of work is described by a utilization coefficient, determined by optimum (minimum) joint costs of fleet and port, connected with a definite number of arrivals and cargo. It is clear, that bigger ships should be serviced by berths with larger turnover capacity. The number of arrivals of such big ships is very critical for the port's layout planning, because if the assumed utilization coefficient is not reached, the economic results of such scheme would be influenced very significantly. Some other course is possible too, i.e.

to organize the servicing of such ships at conventional berths with long service times, but this solution, of course, is less efficient in the sense of minimum costs.

CONCLUSIONS

Theoretical analysis, the results of investigations, and existing trends in the development planning of deep sea fishing vessels, allows us to formulate the following statements:

- **Operations research methods, especially queuing theory, can and should be applied in the analysis of fishing port performance.**
- **As stiller bigger fishing vessels are introduced into service, the costs for adequate and specialized berths are increasing.**
- **The needs of fishing fleet and port economics demand an increase of service speed, as the ship is better utilized then and the number of berths required is smaller.**
- **The demand for increasing speed of service requires the introduction of more efficient handling schemes with larger retention capacities.**
- **The operational methods of deep sea fishing fleets influence the layout of the fishing harbour. The analysis of such schemes must be carried out, analysing at the same time the results for the fleet and for the port. The joint optimum of costs is the solution of the problem.**
- **The criterion function for this analysis should be the joint minimum of delay costs of the fleet and idling costs of the port. Operations research methods should be applied.**

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Some Aspects of the Choice of Location for Fishing Ports

by J. Lüsch

Quelques aspects du choix du site des ports de pêche

Dans la présente communication trois critères simples, ne suscitant guère de difficulté, sont exposés qui doivent être pris en considération avant toute extension de ports de pêche: profondeur de l'eau dans les ports, communications avec l'arrière-pays et coût du transport. Les possibilités fondamentales d'extension sont indiquées sur la base de la profondeur des chenaux d'entrée des ports de commerce présentant un accès commun avec les ports de pêche qui leur sont associés.

Consideraciones sobre la elección del emplazamiento de puertos pesqueros

El autor reseña tres posibilidades sencillas y de fácil ejecución de reducir el número de puertos, que pueden ser objeto de comparación al realizarse estudios preliminares para ampliar los pesqueros. Estas son: profundidad del agua en el puerto, communicaciones con el interior y costo del transporte. Se indican las posibilidades fundamentales de las ampliaciones, basadas en la profundidad de la entrada de los puertos comerciales que también lo sean pesqueros.

FISHING ports may be considered as connecting links between the deep-sea fishing operation and the manifold enterprises engaged ashore in handling and processing, storage, and transport of the landed products. All these enterprises have completely different interests, thus the location of a fishing port will probably never meet all the needs and, at best, merely offer a majority of the more essential. Originally the fishing ports were situated mostly in the immediate environs of important commercial ports which were at the same time consumer centres. Because of the perishable nature of fish, overland transport was only possible within limits, except for salt fish.

However when railways became a relatively cheap overland carrier and the simplification of preservation processes aided by the production of artificial ice permitted longer transportation distances, further new customers for fish products were gained. In this manner deep-sea fishing received a considerable impetus, requiring an extension of the existing fishing ports. The old locations, however, in most cases did not provide possibilities for extension. New ports were often constructed at locations more suited to the new conditions since it was logical that they should be situated closer to fishing grounds. So the number of fishing cruises increased. In general these have remained the principal ports to the present day. By the introduction of modern deep-freezing techniques in deep-sea fishing and by using essentially larger vessels, further works have become unavoidable in the existing fishing ports. In some countries these extensions have been completed as far as existing ports permit, while in other countries such works have still to be accomplished. In most established fishing countries the demand is not so much for new ports but rather for the extension, in a suitable manner, of existing fishing ports.

DEMANDS ON PORTS BY CATCHING AND PROCESSING VESSELS

Catching and processing vessels make four main demands on existing fishing ports, as compared with vessels landing fresh fish. These are:

(a) Increased depth of the water in the port.

(b) Large cold storage plants for deep-freeze products to make handling of the vessels independent of immediate availability of insulated overland transport.

(c) Special plants for handling and storing fish meal and fish oil.

(d) Improved facilities to give quicker turn round.

Independent of these principal demands the following preconditions of location are also important as compared with ports for fresh fish landings only:

(e) Location as near as possible to where the fish are caught—although the influence of travel time, at least for smaller countries, has decreased with the introduction of larger and speedier vessels.

(f) Possibilities for adequate extension of port facilities and also for fish-processing industries.

(g) Existence of suitable through transportation services to the hinterland.

Assuming the costs for the realization of handling and storage facilities, for deep-freeze products, fish-meal and fish-oil are approximately equal in all ports and, for the present, omitting the varying costs for possible extension, the remaining factors are reduced to potential deepening of ports, and the establishment of transportation to the hinterland. Frequently other factors must be considered

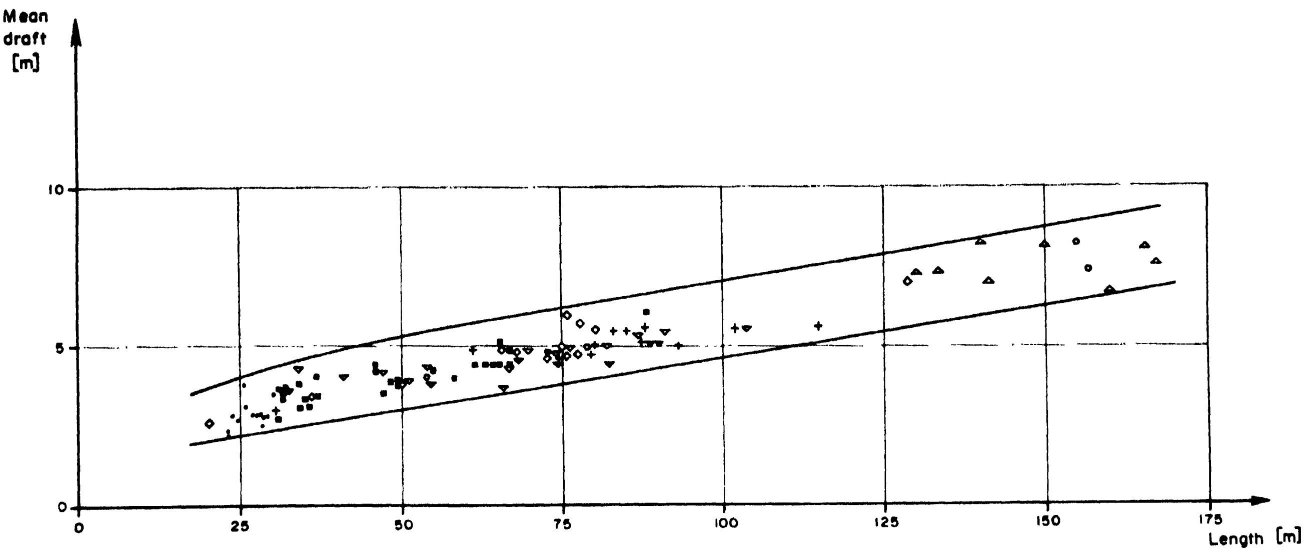

Fig. 1. Relationship of draft to length for German fishing vessels

regionally when choosing the location, such as the residence of fishermen, location of shipyards, varying port charges, fuel prices, etc. Many of them, however, may have only limited influence on final choice.

The three factors of water depth, connections to the hinterland and cost of transport will now be discussed.

Water depths at the port

If the present water depth of important fishing ports is compared with the water depth of commercial ports at the same locations, and especially with the depths of their common entrance channels, certain fundamental conclusions may be drawn. As a rule, the expense of deepening the entrance to a port greatly exceeds that for constructing or deepening the berths. Table 1 shows the results of a study for 63 important fishing ports. If, according to fig 1 and Table 2, a water depth at the port of at least 8 m (26.4 ft) is demanded for catching and processing vessels, more than 30 per cent of the considered ports are beyond the scope of the location investigation. The study indicates that there might be advantages for the fishing port which has a common entrance with a commercial port. It can also be seen that there are possibilities for extension even for the biggest mother ships in about 25 per cent of the studied ports. A minimum depth of 10 m (33 ft) should be considered necessary for this type of port, according to fig 1.

TABLE 1. STATISTICAL STUDY OF THE WATER DEPTHS OF CERTAIN COMMERCIAL PORTS AND THEIR ASSOCIATED FISHING PORTS

WATER DEPTH OF COMMERCIAL PORTS [m]	WATER DEPTH OF ASSOCIATED FISHING PORTS [m]																SUM	
	3 3 99		4 4 99		5 5 99		6 6 99		7 7 99		8 8 99		9 9 99		10 10 99			
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
4 4 99			1	5													1	16
5 5 99			2	10	1	7 5											3	4 8
6 6 99			1	5	1	7 5	1	12 5									3	4 8
7 7 99			7	38	3	23	1	12 5	2	15 5							13	20 5
8 8 99	1	50	1	5	4	31 5	3	37 5			2	67					11	17 4
9 9 99	1	50	3	16	3	23	1	12 5	6	46 0	1	33	1	33			16	25 4
10 10 99			3	16	1	7 5	1	12 5	2	15 5			2	67			9	14 3
11 11 99			1	5					1	7 5					2	100	4	6 4
12 12 99							1	12 5	2	15 5							3	4 8
SUM	2	100	19	100	13	100	8	100	13	100	3	100	3	100	2	100	63	100
%	3 2		30 2		20 5		12 8		20 5		4 8		4 8		3 2			101

TABLE. 2. CLASSIFICATION OF FISHING VESSELS ACCORDING TO DIMENSIONS AND LANDED PRODUCTS

No	TYPE OF VESSEL	LANDED PRODUCTS	DIMENSIONS								
			Length over all [m]		Breath [m]		Draft [m]		Fish hold [m³]		
0	1	2	3		4		5		6		7
1	CUTTER	Fresh fish	10	30	3 40	7 50	1 50	4 00	20	150	•
2	LOGGER	Salted fish	30	50	7 00	8 50	3 00	4 20	120	380	×
3	TRAWLER	Fresh fish	30	80	6 50	12 50	3 00	6 00	100	3500	■
4	COMBI-TRAWLER	Fresh and frozen fish, fishmeal	30	80	6 50	12 50	3 00	6 00	90	1800	◇
5	FREEZING TRAWLER	Frozen fish, fishmeal, fishoil	30	105	6 50	16 50	5 00	6 50	80	3000	▽
6	FACTORY TRAWLER	Frozen fillets, fishmeal, fishoil	60	130	9 50	19 00	4 80	7 00	1000	3000	+
7	REFRIGERATED VESSEL	Fresh fish and salted, frozen fish and fishmeal	55	160	10 00	22 00	4 00	8 50	1600	1300	○
8	FACTORY VESSEL	Fresh, frozen, salted, canned fish, fishmeal, fishoil	130	170	17 50	24 00	7 00	8 50	8000	1500	△

Connections to the hinterland

Consideration of connections to the hinterland of fishing ports in general seems to be not very reasonable, when carried out only for these 63 ports compiled at random.

TABLE. 3. CONNECTION TO THE HINTERLAND

COMMERCIAL PORTS (water depth) [m]	TRAFFIC STREAM [n/port]			
	Railway line		Road	
	main	secondary	main	by-road
4 4 99		1 00	2 00	
5 5.99	0 33	2 00	0 33	
6 6 99		0 33		1 00
7 7 99	0 54	0 46	0 46	1 38
8 8 99	0 82	0 64	0 91	1 64
9 9 99	1 38	0 88	1 38	1 50
10 10 99	1 22	0 88	1 22	1 00
11 11 99	2 00	3 00	2 50	1 50
12 12 99	2 33	1 67	3 00	0 33

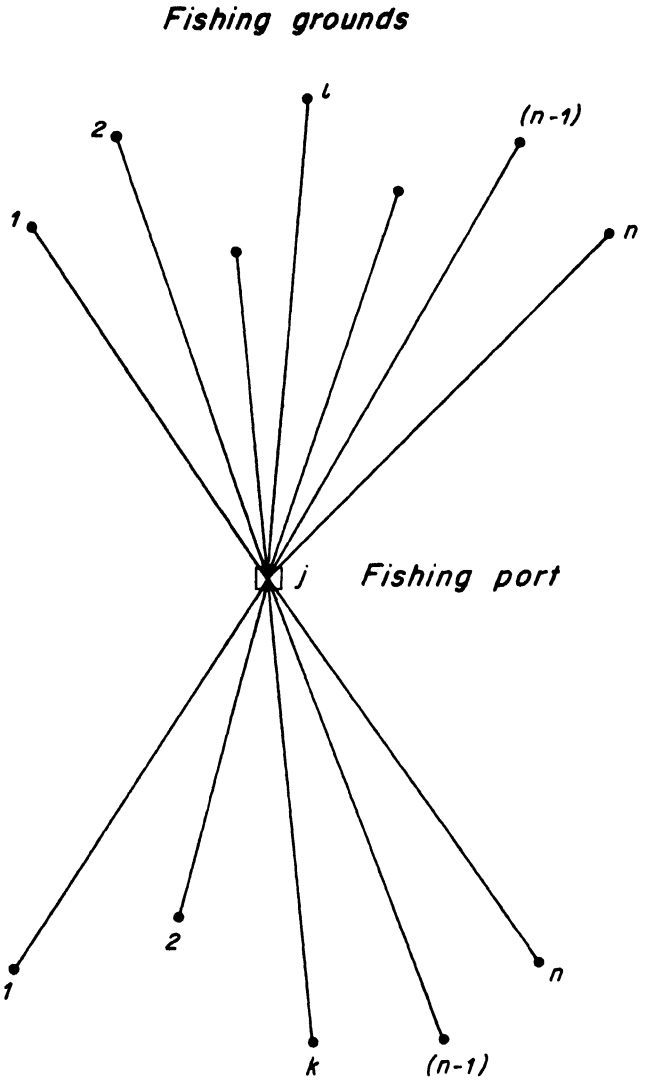

Fig. 2.

The chosen method is not very meaningful, because only the number of railway and road connections respectively branching off the port location could be compiled and this is quite insufficient for assessing the capacity of the hinterland. Nevertheless it may be seen quite clearly that ports with a greater water depth in the commercial port have obvious advantages as compared to those with lesser depth (see Table 3).

Transportation costs

Whilst these comparisons of location only produce qualitative results for preliminary studies, the influence of the situation of a port on the cost of transport must be determined more exactly. Figure 2 shows the tasks being set. In general the optimization of location can be reduced to the comparison of a few locations for which the cost of transport often may be the decisive factor. This influence however decreases when distances to the fishing grounds become longer.

Notation:

x_{ij}	distance from catching place i to location of port j
n_i	number of cruises in the relation i per annum
K_i	average cost per ship and unit of distance in the relation i
y_{kj}	distance from location of port j to consumers' location k
M_k	transported quantity to be moved per annum to consumers' location k
K_{kj}	cost per unit of quantity and distance from location of port j to consumers' location k

For the "m" locations of ports the optimal one is that for which

$$\sum x_{ij} n_i K_i + \sum y_{kj} M_k K_{kj} \text{ is a minimum.}$$

SUMMARY

This contribution shows three simple and not very troublesome possibilities of reducing the number of the ports to be compared when preliminary studies for extension of fishing ports are carried out. Moreover the fundamental possibilities of development are also indicated by the data for the entrance depth of those commercial ports having a common entrance with their associated fishing ports.

Factores a Considerar en la Preparación de Proyectos de Puertos o Terminales de Pesca

por A. Miyares del Valle

Elements to be considered when preparing fishing ports projects

This paper sets forth the main factors which will have to be taken into consideration when preparing a Fishing Terminal Project, particularly those concerning the activities that will be integrated in the industrial complex planned and the capacity of its various sections or departments; pointing out the tendency to exaggerate the importance and extent of these factors and the consequences and risks that might result from such an over-estimation.

Facteurs á considerer lors de la preparation d'un projet d'un port de pêche

L'auteur fait l'exposé des principaux facteurs qui doivent être pris en considération lors de la préparation d'un projet d'un port de pêche, particulièrement ceux ayant rapport aux activités que l'établissement industriel projeté aura à exercer et à la capacité des diverses sections ou départements. La tendance à exagérer l'importance de ces facteurs et les conséquences qui peuvent en advenir de ce fait sont aussi mises en relief.

UNO de los problemas que más dificulta el progreso pesquero en los países en desarrollo, es la carencia de terminales pesqueras en los puertos o la deficiencia de las instalaciones portuarias que utiliza la flota. Esta circunstancia no solamente se refleja en la ineficacia de la operación de los barcos, con su secuela de bajos rendimientos, altos costos de operación y otras dificultades y quebrantos, sino que suele ser también causa directa de diversos vicios que se arraigan en la industria, obstaculizando la posibilidad de expansión de los mercados internos y/o de exportación.

El no contar con las facilidades que permitan centralizar las operaciones de los barcos y organizar en consecuencia los suministros, y servicios a la flota y la conservación e industrialización de su producción, hace difícil, entre otras cosas necesarias al progreso pesquero, extender los beneficios del seguro y del crédito a las embarcaciones, y suele ser la causa principal del fortalecimiento de un intermediario que, aunque necesario en estos casos, se convierte con frecuencia en el factor preponderante y regulador de la industria, que llega inclusive a imponer modalidades y costumbres que responden primordialmente a su interés particular, casi siempre en conflicto con los legítimos intereses de productores y consumidores.

Es una preocupación común de los gobiernos y empresarios pesqueros de estos países superar estas deficiencias; sin embargo se observa una tendencia, bastante generalizada, de abordar la solución de este problema al margen de la realidad, especialmente en los casos en que la decisión y ejecución de los planes no está en manos de los hombres de la industria. Esta tendencia tiene su origen por lo general en el deseo de liquidar la etapa de penuria en que se venía desenvolviendo la industria y ganar los años perdidos, salvando de una sola vez y en ocasiones de modo espectacular, la distancia que media entre la falta de facilidades y/o el desempeño de la pesca en forma casi primitiva, y el ejercicio de esta actividad contando con los medios de producción e instalaciones más modernas, en el afán de colocarse al lado de los países que, por evolución, se han mantenido a la vanguardia del progreso pesquero.

Esta tendencia, lejos de conducir a un progreso efectivo, se torna con frecuencia en un factor que se refleja negativamente en la finalidad que se persigue, ya que la experiencia obtenida de un primer intento de establecer un programa de fomento pesquero puede llegar a aconsejar desistir de planes que, enfocados de un modo racional y en proporciones más modestas, hubieran sido factibles y hubieran podido contribuir de un modo efectivo al desarrollo de esta industria.

ELEMENTOS A CONSIDERAR EN LA PREPARACION DE UN PROYECTO

Los principales factores a considerar en la preparación de un proyecto de Puerto o Terminal Pesquero, pueden clasificarse por su naturaleza en dos grandes grupos: aquéllos que son comunes a todos los proyectos y los que son particulares o específicos de cada proyecto.

Dada la limitación del presente trabajo, y siendo el principal propósito destacar la importancia y trascendencia de una correcta evaluación de los segundos, haremos tan solo una referencia somera a los primeros.

Factores comunes

Independientemente del complejo industrial que se pretenda establecer, cuya planificación variará según las peculiaridades de la pesca de la región, las características de los barcos a ser utilizados y las necesidades de industrialización, de acuerdo con las modalidades de los mercados a los que la pesca se destine; existen otros factores que por ser comunes a todos los proyectos deben tenerse presentes en la planificación de todo puerto pesquero. Aunque de un modo muy general, nos ocuparemos del más importante, que es el relativo a la ubicación del puerto o terminal pesquero, resumiendo a continuación los aspectos a ser considerados, como sigue:

(a) Como cuestión primordial el puerto pesquero deberá estar ubicado lo más cerca posible de los caladeros, en un lugar protegidos, que constituya un abrigo natural para la flota y que sea de fácil acceso para las embarcaciones aún en los casos de mal tiempo. Se deben evitar lugares que requieran dragados frecuentes, ya sea en el canal de acceso al puerto, o en el lugar que sirva de fondeadero de la flota. El calado en los muelles de atraque, a menos que cambie el porte y calado de las embarcaciones, no suele ser mayor problema debido a la limpieza constante que hacen los barcos con sus propelas en las maniobras de atraque.

(b) El lugar elegido deberá contar con buenas vías de comunicación con los mercados principales de consumo. Este factor es de la mayor importancia, ya que el costo del transporte de los productos de la pesca hasta los mercados será uno de los elementos que más influyan en el resultado de la explotación. Resulta igualmente importante en este sentido el transporte hasta el puerto de los suministros para el consumo de la flota, como son el combustible, artes y equipos de pesca, efectos navales y material de reparaciones y otros que no se produzcan en el propio puerto.

(c) Será elemental que el lugar elegido cuente con abundantes suministros de agua potable y energía eléctrica, aún en los casos en que la terminal de pesca tenga su propia planta de energía.

(d) Debe tenerse en cuenta igualmente la mano de obra calificada necesaria, tanto para las operaciones industriales como para los servicios de reparaciones y mantenimiento de la flota.

(e) De no contar el puerto con varaderos y talleres para las reparaciones y mantenimiento de la flota, el factor distancia hasta donde se encuentran ubicados otros puertos con estas facilidades, debe ser debidamente considerado.

Por lo general, los lugares donde tradicionalmente se han agrupado los pescadores que abastecen los mercados locales más importantes, suelen ser los mejores lugares para la construcción de puertos pesqueros, siempre que en los mismos se cuente con espacio interior suficiente para la construcción de muelles, emplazamiento de la unidad industrial, fondeadero, expansión futura, etc., y que el canal de acceso al puerto tenga suficiente calado o pueda ser fácilmente dragado, en previsión de la evolución de la flota hacia unidades de mayor porte.

Factores específicos

Son dos, los que fundamentalmente deben ser considerados en la etapa de estudios o planificación, pues ambos son determinantes de la magnitud o proporciones de la obra a ejecutar.

(a) Actividades y operaciones industriales que deben integrar el complejo industrial que se proyecta, que darán origen al establecimiento de las diversas dependencias o secciones de la industria.

(b) Capacidad de estas dependencias o secciones.

De la correcta evaluación de estos factores, que por su similitud bien podrían refundirse en uno sólo, puede depender el éxito o fracaso de un Proyecto de Terminal de Pesca, y es precisamente de una apreciación exagerada u optimista de los mismos que se deriva el mayor peligro.

Es frecuente encontrar Proyectos donde se han incluído actividades y operaciones industriales innecesarias, que dan origen al establecimiento de dependencias o secciones que no tienen justificación, y que en ocasiones hasta resultan contradictorias con la política de desarrollo pesquero que se intenta desenvolver. Como ejemplo de este caso, pueden citarse las plantas para la fabricación de harina de pescado, que suelen concebirse como departamentos modernos de instalaciones complejas y gran capacidad aun cuando, por carencia de materia prima apropiada, solamente se cuente con desperdicios procedentes de los diversos procesos industriales para ser convertidos en harina. La sección o planta de enlatado, es otra de las dependencias que es frecuente se proyecten también en exceso de las necesidades reales, aun en los casos en que no existan suficientes recursos conocidos apropiados para estos procesos o en los que ya exista en el país una industria conservera establecida, en condiciones de hacer frente a la industrialización de los incrementos de producción previstos.

El exceso de capacidad al planificar las dimensiones de las diversas dependencias o secciones, por basar los estudios en cálculos de producción que no pueden ser alcanzados posteriormente dentro de las proyecciones previstas, es otro caso bastante frecuente. Como ejemplo de este caso, tenemos los túneles de congelación estimados al doble y aún al triple de las necesidades reales de un período razonable de tiempo; los almacenes refrigerados, que con frecuencia son calculados a más del doble de la capacidad real utilizable y las plantas o departamentos de fabricación de hielo, que también se suelen proyectar con capacidades superiores a las necesidades reales de consumo.

CONCLUSIONES

Las consecuencias de exagerar las proporciones de estas obras son bien conocidas. Los resultados de las operaciones serán tanto más adversos, según la magnitud del error en el cálculo del volumen de materia prima a manipular o industrializar y la capacidad industrial que quede ociosa. Ambos casos representan un exceso de inversión, sobre el que recaerán fatalmente los intereses y plazos de amortización correspondientes, depreciación, mantenimiento, seguros, etc., recargando notablemente la carga fabril y los costos de operación en general, con el riesgo de que se encarezcan los procesos industriales y servicios prestados hasta el punto de hacerlos incosteables.

La única forma de evitar estos riesgos, cuando se desconoce la variedad y potencial de los recursos o no existe una correcta evaluación del grado en que pueden ser explotados, es partiendo de las realidades conocidas o previstas de acuerdo con la tendencia indicada por las estadísticas, dejando abierta la posibilidad de expansión industrial para el futuro. En este caso, será necesario tener en cuenta al proyectar una primera etapa, la superficie de terrenos, espacio para muelles, etc., que será necesario dejar disponibles para cuando se lleve a cabo la ampliación correspondiente.

Podrá parecer exagerado poner tanto énfasis en destacar aspectos tan elementales y tan conocidos de todos los que se relacionan con la industria pesquera; sin embargo, en opinión del autor de este trabajo nunca estará de más llamar la atención sobre los mismos ni alertar una vez más sobre el peligro que se corre al no darles ponderada atención: una gran mayoría de los proyectos de Terminales de Pesca examinados por el autor, padecen en mayor o menor grado de uno de los dos males señalados y, en ocasiones de ambos. Esta circunstancia eleva considerablemente los estimados de inversión, malogrando inclusive proyectos que hubiera sido factible ejecutarlos, de haber sido formulados de acuerdo con las realidades y posibilidades de la industria pesquera en que se basaban.

DISCUSSION

PLANNING AND LAYOUT OF FISHING HARBOURS

Marchal (France—Chairman) noted that in the absence of a classification for fishing ports the whole subject of planning and layout of fishing harbours must be tackled in a very general way. It was suggested that the contributors might focus on the following points in their discussion, bearing in mind that it was not an exhaustive list:

- (a) Definition of fishing port activities; future developments; the number and type of vessels likely to use the port and the amount of time they would stay in the port;
- (b) The question of the sea and land area needed;
- (c) Provision of quays, their layout and use;
- (d) Provision of supplies, repairs, definition of the necessary infrastructure and corresponding equipment;
- (e) Unloading methods, handling, transport, fish market, ice plant, ships' cooling, freezing chambers, etc.;
- (f) Facilities for crew, hospital, hotel, recreational possibilities, etc., educational centre, garage, bank;
- (g) Management;
- (h) Possibility of fire protection and radio links with the ships, industrial installations, etc.

A certain number of delegates had submitted papers on these subjects. Guckian, in his paper had questioned the desirability of having a fishing port installation near a commercial port. Should the fishing port then be arranged within the commercial port or should it rather be outside the commercial port? The speaker, in his paper, tended to prefer having it outside because of the future development requirements of both ports and the necessity of keeping the very different type of provisions and facilities separated.

Experience in Ghana

Dalman (U.K.) described the planning and development of the two fishing harbours at Tema, each of an area of about 35 acres (14 hectares).

In 1964 the Ghana Government had asked Sir William Halcrow and Partners to make an appraisal of the berthing facilities needed to meet new requirements of the fishing industry and the Ghana Navy. This did not include checking whether the proposal to land 180,000 tons of fish per annum by 1970 was realistic.

Consideration had been given to providing sufficient accommodation within the existing harbours. It was planned that by 1965 there would already be 850 m (2800 ft) of quay with widths between 3.7 m (12 ft) and 6.1 m (20 ft), 120 m (400 ft) run of motor-boat jetty, 610 m (2000 ft) run of canoe beach. There was considerable scope for development and by the completion of perimeter berths and a large finger quay in the Outer Harbour a total length 1280 m (4200 ft) of quay could have been made available for medium-sized and large trawlers, plus provision for smaller craft in the Inner Harbour, plus provision for the navy in the Outer Harbour.

However, with such concentrated development of quays and the associated handling and transport problems, they believed that the rate at which fish could be handled at the discharge quays could not be expected to average more than 130 tons per m (40 tons per foot) run per annum. Calculations indicated that a maximum of 130,000 tons per annum could be landed, which was 50,000 tons less than the target of the Ghana Government. It was clear, therefore, that development of the inner and outer harbours could not provide adequately for the requirements of the fishing industry in 1970, consequently a separate new harbour had been proposed, as illustrated in fig 5 of Loewy's paper. The drawing showed the long-term development plan for the three harbours; the ultimate capacity would be potentially more than the planned figure of 180,000 tons per annum and only one of the finger jetties in the new harbour would have been needed initially.

The statistics for 1967 recorded about 57,000 metric tons landed at Tema. Many requests have been made for plots in the commercial area. Further development was likely to be by progressive expansion in the two existing harbours rather than by the building of a third basin.

Simulation techniques

Anctil (Canada) referring to previous speakers in Sessions I and II, noted that the technical problems and socio-economic aspects were indeed highly complex in connexion with the planning of fishing ports and this had been clearly highlighted. Some examples of solutions had been put forward but it was quite obvious that more global solutions would be necessary in order to help integrate all the factors. Normally computers and recent research in sectors such as the space industry had led to new analytical methods which were available. Anctil (Session X) gave more details of these simulation techniques and their application to the fishing port. Such techniques could be used on various levels; firstly on the national level in studying different systems of fishing port layouts and distribution networks; secondly, they could be used in order to improve operations of existing ports or to help plan 'future operations. These techniques were being increasingly used with great success for planning of commercial ports and he saw no reason why they could not be used regularly for the solution of fishing port problems. Initially the cost of simulation was very great but recently they had become much cheaper.

He was convinced that simulation techniques on a macro-economic or micro-economic scale should certainly be used for the basic work in the development of the fishery harbour complex.

Changes in Japan

Seo (Japan) gave some information on the Japanese Government Port planning systems and said that the Central Government had established a system of development planning which was executed by means of a governmental programme. The total construction cost was normally subsidized at a rate of 50 per cent but sometimes at as much as 90 to 100 per cent. During the preparation various factors were taken into consideration and the rapid changes taking place in fishing methods and in the fields of marketing of the products had caused the Central Government to adapt the plan to take account of those changes.

One of the most important changes which had taken place, apart from the development of mechanization of the smaller vessels, was the increase in size of fishing vessels. Others were changes in the layout of fishing ports and enlargement of berthing and mooring facilities, often accompanied by the construction of breakwaters in deeper waters or in places subject to unfavourable natural or physical conditions. The development of what was called the "cold-storage chain" following increased demand for frozen or highly processed products was another recent change which also had some effect even on the layout of fishing ports. Examples of this would be the special landing and deep-freezing plants required. At a number of existing major fishing ports it had therefore become necessary to add completely new wharves and structures. In many cases this had been met by finding a suitable site close to the existing facilities and in some cases an attempt had been made to establish a complete set of facilities at the new site rather than separating the required functions into both the existing and the newly-added wharf.

Cormack (Canada) said that another Canadian participant had mentioned that Canada had a scheme for financial assistance for the transfer of population of fishing communities which had, for economic reasons, become redundant. In this connexion it was difficult to divorce the tangible elements from the intangible when planning major changes, and he wished to draw the attention of engineers, designers and other participating agencies involved to the fact that equal consideration should be given to the human factors before any firm conclusion was arrived at.

Another point concerned the conflicting opinions expressed on whether fishing ports and commercial ports could operate as separate units or in close proximity. Traditionally the shore operations of the fishing industry had always paid lower rates to workers than did other industrial establishments. Whether this disparity could be justified was open to debate but the speaker maintained that one could not marry both a fishing port and a commercial port without risking, amongst the many other difficulties, a labour problem created by competing with more highly paid jobs.

Gifford (U.K.) supported the need for a comprehensive management structure for fishing ports but he believed that the civil engineer could often fulfil this task during the planning and construction stages, and engineers should not be reluctant to accept the responsibilities of management, provided that they equipped themselves with the additional knowledge of economics and planning.

Drawing attention to Gifford's paper (Session V) on the new fish market and quay at Brixham, U.K., he said he believed that this paper could be used as a guide to those people concerned in developing an existing local port into a larger district port. The improvement in fishing at Brixham, which had largely been brought about by modern navigational equipment and the formation of a co-operative marketing organization, had been frustrated by the inadequate berthing facilities, the improvement of which formed the subject of the paper.

Careful planning needed

Pérez Bellod (Spain) remarked that it was necessary to emphasize the importance of development planning in countries where there were no fishing ports or where they were starting from very primitive landing facilities. Countries that had to start developing their fisheries thought of the riches along their coast which they could not use; they planned their facilities and terminals of fishing ports bearing this in mind. Very modern ships or ships more mechanized than the older ones would probably be built but the port should be planned on lines similar to the more traditional ports found in the more developed countries, and not the super-mechanized major ports now existing in a number of countries. Larger vessels with freezing facilities on board should only be introduced in countries where there was already a certain development. Therefore, in developing countries where modern fishing techniques had still to be introduced, fishing operations would have to be conducted rather close to the shore and where freezing was necessary it should be carried out on land.

There was no doubt that the introduction of freezer vessels constituted a change in the fishing industry which would be re-echoed in port development. In the port of Vigo and many other Spanish ports this had happened. In Vigo in three years they had proceeded from zero to a total annual production of 60,000 tons of frozen fish. This had implied the introduction of different types of vessels, among these, freezer ships that brought their own fish from distant fishing grounds. In other cases, the need for higher yields had made it advisable to land the catch at certain ports nearer to the fishing grounds and to use merchant ships with their own freezing and cold storage on board and factory ships which, besides freezing, had their own fish meal and even canning plants on board. Of course, few existing ports had adequate facilities for such vessels or for handling such packaged products. This had led initially to the use of commercial quays, unloading by means of cranes, using pallets and other traditional systems of unloading, then transporting by trucks or other mechanical means to the fishery cold storage area. In ports where greater specialization in the commercial area meant that there were piers or docks with their own cold storage to enable the handling of products such as meat and others, these had also been used for frozen fish. He believed that the next step to overcome existing difficulties should be the construction of special separate facilities, including cold storage; such quays should as a rule be extensions to, or as far as possible, part of the existing fishery ports with the increased provisions to handle these larger types of vessel.

Value of small ports

O'Mealláin (Ireland) suggested that when considering the selection, design and construction of fishing ports it should be recognized that in certain circumstances installations which would be of minor importance in highly developed fishing countries were, in fact, of major significance economically and sociologically. Just as much, and as careful, attention had to be given to the small as well as to the large ports. No doubt the costs of investigation in the smaller provision were proportionately higher than those in large undertakings but they were not necessarily excessive in relation to the capital expenditure involved.

Development planning of major fishery harbours did not preclude that of minor ports. Such minor ports would probably continue to have an important role to play for many years in the future, even in highly-developed countries. Indeed, certain resources in particular areas could be exploited most economically by small craft based on small ports.

It should be borne in mind that land space was just as important at small ports for their economic functioning as at large ones. Given reasonable facilities all round and, in particular, adequate shore space, the small port could make significant contributions to overall national economy as well as to that of the region in which it was situated and it could have great sociological importance. Neither need small ports disappear with the development and growth of large ones in the neighbourhood; indeed, the bigger ones could instil new life into their smaller neighbours.

It was doubtful whether the transfer of population from small to large ports, as suggested by a Canadian participant, was always desirable and certainly not always possible in many of the developing countries.

Common or conflicting needs

Lafouge (France), pursuing the difficulties expressed in providing fishery installations within a commercial port, suggested that occasionally expenditure might be reduced by using protection works and approaches already provided for a commercial port. Although this solution might be an easy way out, it was also a dangerous one, not only because it could jeopardize future development possibilities for fishing but would also present difficulties for the actual operation of the fishing port.

The activities of a fishing port differed greatly from a commercial port, not only as far as the vessels and their needs and the rhythms at which they operated were concerned, but also with regard to the people working in these two types of operation. These factors could create difficulties and hamper the activities and in Boulogne it had been found necessary to separate the fishing port completely from the commercial port.

Another point, linked with the first, was the area of land needed for an industrial fishing port. A relatively large area was required as compared with the commercial unit because in addition to quays, provision had to be made for a whole industrial complex to deal with the processing, the transport and, generally speaking, the commercialization of the fish. In Boulogne, in a port planned for an annual tonnage of 200,000, an industrial area of 70 hectares had been provided and was not under-utilized.

Stammers (U.K.) suggested that the most satisfactory method of producing an appraisal and study for a fishing port was for the fishing experts, economists, engineers, etc. to be in one organization and not separate parties attempting to co-ordinate their own expertise without the benefit of an umbrella organization.

A Mexican case

Lomeli Delgado (Mexico) said that the basic planning of a fishing port could not be brought together under one methodology because conditions varied so much according to the location and the economic and political position of the country concerned. Mexico had had some positive and some negative experience in this field. About five years previously they had planned and built the fishing port of Alvarado, at a cost of about 8 million dollars. Political, economic and social factors had been analysed and economic studies were made before starting the work. From the engineering point of view it could be said to be the best type of marine work carried out in Mexico in recent years. There was, however, one aspect which had not been solved and that was the shortage of manpower and the preparation or training of personnel who could catch long distances off shore. It had also been estimated in the plan that over 40 vessels would be based there but at present only six had materialized.

As had been mentioned it was also intended to establish small fishing communities so that, besides giving work to a growing population, a source of food supply would be provided for the coastal population.

Other problems faced by Mexico concerned the development of the lagoons for fishery purposes, where previous development had centred on irrigation and other hydraulic purposes.

Scheiner (IBRD) referring to Lomeli Delgado's statement that a fishery terminal at Port Alvarado costing U.S. $8 million was serving only six vessels of approximately 10 per cent of the planned fleet, asked the questions: what was the cost of a pound of fish caught, and for what reasons did the economic planning and the biological research go overboard?

Lomeli Delgado (Mexico) in reply, stated that many different factors had to be borne in mind when planning such a project and one of the principal factors was the political one. Although the port of Alvarado was an example of what could and should be done with modern techniques from the engineering point of view, due to lack of policy of continuance of the work the plan had not developed along the lines intended. Although the economic study had been completed, with the help of the Dutch experts, the actual provision of the necessary fleet to ensure that necessary raw material was available had not been made. The port facilities, which were the best in Mexico and perhaps in Latin America, did not give the adequate yield because the port was working at much less than designed capacity.

Gutierrez Olguin (Mexico) added that no doubt the port of Alvarado was a failure in the planning of fishery ports, but an integrated plan had not been carried out for various reasons. The location of the port of Alvarado from the point of view of communications, population, etc. was the correct one, but the geographical site of the port from the point of view of the biological resources of the sea was not good. The best natural resources in the seas around Mexico were to be found in the Pacific Ocean and not the Atlantic Ocean nor the Gulf of Mexico. The State of Veracruz, where Alvarado was situated, was on the continental shelf of the Gulf of Mexico where there was some trawler fishing but no large industrial type fishing, as was the case with tuna and other similar species to be found in the Pacific side. The port of Alvarado had been planned for the products of multiple fishing which amounted to less than 2 per cent of the total volume of the national fishery, and not 25 per cent as planned for the first five years of its operation.

Mexico had, however, recently opened a new fishing port in the Caribbean area in the State of Yucatan: the shelter port of Yukalpetén. This new experience at half the cost of Alvarado, would represent a new step in the development of their fisheries as it was sited near an important fishing ground.

A link in India

Holliman (FAO) referred to the question of relating commercial and fishing port development. There seemed to have been a suggestion that this, by and large, was an undesirable development and he suggested that there might be two sides to this argument. He appreciated the dangers to the fishing port development by relating it too closely to a much larger and perhaps economically more important commercial development: the fishing element might get swallowed up, its interests might be relegated to a very low level of priority, quite apart from the practical problem that might arise from the point of view of traffic congestion in the port and the approaches to it. However, he felt that in new areas of development in virgin territory when commercial port development was being considered, serious thought should also be given to fishing port development.

It was, of course, realized that such developments cost a great deal of money. As in most countries the amount of capital available for investment was limited, so all possible economies in the development of port and shore-landing facilities had to be considered. In his opinion the advantage of attaching fishing port development to new commercial port development was obviously that the fishing port and the fishing industry could take advantage of the infrastructure need and the infrastructure development found to be created in relation to the commercial port, in particular improved or new road and rail communications and port services. An example of this was to be found in one of the developments in India, at Haldia, where there was a fairly happy matching of needs and where the two ports where the vessels actually came in and landed were quite distinct. The commercial port entrance from the river was several miles away from the fishing port entrance but, nevertheless, those two elements were directly linked with new road and rail communications and all the land facilities that were being built in support of the proposed maritime landings. He therefore suggested that the idea of linking these two should not be rejected out of hand because in many cases there was great economy to be achieved in capital construction.

Causes of failure

Guckian (FAO) replying to two points raised during the session, noted that Mexican development of Alvarado had not as yet been successful and that some blame had been placed on the system of co-ordination of planning efforts. It was his opinion, and this had been borne out by the latter Mexican delegate, that the failure was most probably due in any or all of these aspects to:

(a) Undue interference by non-fishing interests causing a non-viable project to be put forward as a feasible one;
(b) Persons being appointed to develop a plan who were not experts in the subject, or who did not co-ordinate their findings and plans in an effective manner.
(c) Failure to implement an integrated plan in many of its essential aspects.

The latter reason was commonly noted in some developing countries, probably through lack of foreign currency to implement important and essential components of the plan.

The other important topic, incorporating fishery harbours within commercial ports, had been rejected by most delegates as unworkable. Holliman had asked for its consideration as an important aspect in developing countries. Haldia had been quoted as a good example, but he had shown that both ports were several miles apart; perhaps this might be a solution in exceptional circumstances where common approach channels could be used with safety and use made of the very important roadway systems, but it would always be necessary to keep both the operational control and the fisheries administration as completely separate as possible from the commercial port jurisdiction. There had been cases of difficulty in the developed countries in this respect. Bremerhaven was separating itself in ownership and administration from its nearby big brother as a result of past experiences. Gothenburg port had never been happy with its fish landing port situated amidst its ocean jetties, and a similar situation in Bolougne had also been mentioned by Lafouge.

It was very doubtful whether there could be any instances where a larger commercial port and a fishery port had successfully or satisfactorily existed within each other's boundaries in any part of the world.

Careful Scottish planning

Cox (U.K.) noted that speakers, both in the morning and afternoon, had referred to problems of obtaining information on which to plan ports and market installations. Recently the Aberdeen Harbour Board had had to consider the reconstruction of fish quays and markets. To assist them, they had formed a working party including representatives from the vessel owners, crews, salesmen, porters, unions and merchants, together with harbour engineers and consulting engineers.

This working party had considered ideas from persons and organizations both from within the industry at Aberdeen and from outside. Many schemes had been considered, although some would in due course be rejected for economic or other reasons. When the final scheme was selected the Aberdeen Harbour Board would know that they had the assent of all parties in the industry, or, at least that the views of all dissenters had been taken into consideration. It was hoped that this would reduce problems in implementing the new scheme.

SESSION III

Planning of Fishing Port and Harbour Facilities in Developing Countries

by J. L. Dibbs

Organisation des installations portuaires, notamment des ports de pêche, dans les pays en voie de developpement

L'auteur étudie les données du développement halieutique et les répercussions dans ce domaine des programmes de mécanisation prévoyant l'installation de moteurs hors-bord sur les bateaux traditionnels et l'introduction de navires de type classique à moteur intérieur. On a jusqu'ici, dans les premières phases du développement, mis l'accent sur l'accroissement de la production, en négligeant l'expansion parallèle des installations à terre.

Etant donné que les renseignements statistiques éventuellement disponibles sont souvent peu dignes de confiance, il importe de faire le point en effectuant des enquêtes dans divers domaines: navires, engins de pêche, production, commercialisation, distribution et services annexes. L'auteur insiste sur la nécessité d'accorder la priorité au développement des pêches. La mise en place de l'infrastructure de base impose une centralisation préalable. La communication donne des exemples de trois formules: 1° apports des petits villages de pêcheurs: 2° mises à terre plus importantes jouant un rôle économique notable dans l'approvisionnement du marché intérieur en produits de la mer: 3° aménagement d'un port de pêche dans l'enceinte d'un port de commerce existant—ou bien création de toutes pièces de ports pour répondre aux besoins d'une économie en expansion, prévoyant l'organisation de pêcheries de type industriel.

Il convient d'insister également sur la nécessité d'une politique de développement des pêches favorisant les investissements. On exprime souvent la crainte qu'un fort accroissement des quantités débarquées ne ruine la pêche traditionnelle. Or, la mise en place d'industries annexes à terre—par exemple entrepôts frigorifiques destinés à régulariser l'approvisionnement des marchés de consommation—peut profiter à la pêche côtière, puisque ces installations lui permettront notamment, lors de brèves pléthores saisonnières, d'écouler à des prix rémunérateurs sa production excédentaire.

Planificación de puertos y servicios portuarios pesqueros en países en desarrollo

Se examinan antecedentes para el desarrollo pesquero y el impacto de programas para la mecanización de embarcaciones tradicionales con motores fuera de borda así como la introducción de barcos de tipo convencional con motor interno. En las etapas iniciales del desarrollo pesquero, se ha puesto mayor énfasis en aumentar las capturas, sin que paralelamente se expandieran las facilidades para el desembarque de productos.

Cuando se dispone de estadísticas, la información provista es poco segura; por ello, es necesario recurrir a encuestas que establezcan la realidad en lo que se refiere a barcos, artes de pesca, producción, mercadeo, distribución y servicios auxiliares de la industria pesquera. Se señala la necesidad de establecer prioridades para el desarrollo pesquero. La centralización es un pre-requisito indispensable para la construcción de obras básicas de infra-estructura. Se indican tres tipos de lugares para el desembarque de pescado: el desembarque en aldea; el desembarque de mayor importancia económica para el abasto del mercado interno y el desarrollo del sector pesquero de un puerto comercial establecido. Como alternativa a esto último, se trata el establecimiento de puertos completamente nuevos, que sirvan las necesidades de condiciones económicas en expansión, incluyendo las del desarrollo pesquero de carácter industrial.

En la sección final se acentúa la necesidad de establecer políticas para el desarrollo pesquero, que estimulen la inversión de capitales. Se expresa a menudo el temor de que un aumento sustancial de las capturás abrumara las pesquerías tradicionales.

Las pesquerías costeras obtendrían mayores beneficios si, por medio de depósitos refrigerados, pudieran regular el abastecimiento de los mercados don capturas obtenidas en períodos estacionales de abundancia.

THE years following the Second World War marked the beginning of an awareness that fisheries formed an important integral part of the national economies of many then colonial and developing countries. Although the fisheries were primitive, using in many cases dug-out canoes or rough planked small vessels of traditional design, equipped only with sails and paddles and gear made from local fibres, the catch provided essential food, and the numbers of people involved in catching, processing, or selling, often formed substantial sections of the population.

This new awareness was reflected in colonial territories by appointment of Fisheries Officers where little, if any, interest had been shown before. The departments which became responsible for fisheries varied from territory to territory, but the most usual were Agriculture, Veterinary, Water and Forests and occasionally, Ports and Harbours, or Maritime Authorities. This often meant that although fisheries had been recognized as a field for development, it continued to be given low priority against the longer established agricultural and other sectors of the economy.

The emphasis during early stages was on technology aimed at increasing production either for a particular fishery which showed promise, or general testing of the known resources. Marketing and distribution, including processing, were to a large extent overlooked.

In reviewing the past years, two factors have led to significant "break-throughs" in production increase. These were mechanization and the introduction of synthetic fibres in fishing gear.

Mechanisation

The approach to mechanization has varied between countries. Where there has been a long established traditional fishery using dug-out canoes, or some form of small planked vessel, the most general approach has been to adapt the small vessel to take an outboard motor; with the second stage of development being a replacement vessel of conventional type with an inboard motor. Other fisheries departments have recommended the introduction of new type vessels with inboard motors to replace the traditional vessels without going through an outboard mechanization programme.

It is usual for these types of mechanization programmes to be supported by government loan schemes.

The success of mechanization has to a large extent been dependent on supporting services. This involves basic training for fishermen, servicing facilities with readily available spare parts, besides available fuel supplies.

To understand the impact of mechanization, the original pattern of the traditional fishery must be understood. Although it is hard to generalize, as each country has its individual character, it can be said that the indigenous fishermen has operated from the most suitable location closest to his home With canoes and small boats which can be easily beached, this may be anywhere from an open beach to a natural harbour or inlet, and within the general area there have been few centralized landing places.

An outboard mechanization programme is unlikely to basically change this pattern, even though increased production may bring about marketing problems in absorbing the catch through the traditional marketing and distribution channels. The introduction of a conventional hull with inboard motor immediately raises the problem of safe moorings and shore installations to facilitate loading, unloading and general service and maintenance.

Planning inshore fisheries

The fisheries departments in developing countries have rarely had available the results of any conclusive research or stock assessment. Rather, their development has been based on improved gear, new fishing methods and possibly limited exploratory fishing operations

The changing political scene, with self-government leading to independence for colonial territories, and increased political pressures in already independent countries, has led to specific development plans to be executed over a given number of years. As these plans are designed to benefit the country as a whole a "crash" programme for fisheries is invariably included if there is evidence that resources exist, as many developing countries are short of protein foods. Whatever the objectives, either increased local fish supplies or export, the emphasis has always been on increased production; but without supporting facilities, these programmes are likely to run into trouble.

Statistical information is generally either non-existent or suspect in the fisheries of developing countries and as basic information is essential before planning infrastructure, fact-finding surveys must be undertaken.

Surveys need to collect the following information:

(a) Identification of all major fish landing places
(b) Number and classes of vessels using them
(c) Number of fishermen employed
(d) Types of gear in use
(e) Estimated total production for each major landing, giving periods of peak production.
(f) Location of fishing grounds, and major fishing seasons by species.

With small budgetary allocations and staff with limited training,.even this information may be difficult to obtain, and as fishing seasons vary from year to year, production figures may be misleading if they are available for only a single year.

Marketing information

Landings of major importance having been identified, must then be related to marketing, processing and distribution, linked in turn with auxiliary facilities which are available, or will be necessary, to service an expanded or different type of fleet with production increases.

This calls for further surveys for precise information on markets and distribution channels, including transport, and accessibility to new markets for extended distribution. The marketing systems which have been evolved over the years can be most complex, involving large numbers of people, indebtedness to middle-men, and close family relationships. As a rule, the quantities handled by individual traders are small with the result that gluts can easily occur with only a slight increase above normal supply.

From initial surveys and fact-finding, **needs and priorities** for improved port and market facilities must be decided.

BASIC FACILITIES FOR A SMALL LANDING

Besides making provision for increased catches, improved handling and care of the catch to avoid loss through spoilage and contamination will be a first objective in a small port development.

As a first step to providing shore facilities, centralization must be achieved. Mechanization will assist this, as with paddle and sail the movement of craft is restricted and time consuming. A central fuel pump can be enough to ensure most vessels coming to a single point.

If the landing is in sheltered water, a jetty will facilitate landing and this can then be the focal point to improved marketing, with the provision of shelter for the catch when unloaded as a first step.

The setting up of a regularized marketing system may take time and must be organized to suit local conditions. The introduction of ice will depend on the distribution of fresh fish and although its use is always recommended, both at sea and on shore, many small fisheries have local outlets where fish is quickly sold or some form of local processing is carried out which extends the keeping qualities during sales.

Such basic facilities, which will probably need to be sponsored by government, do not require skilled management and but little attention. This can be delegated to a local authority or arranged through the fishing community itself.

PLANNING FOR LARGER LANDING PLACES

A not unusual set of circumstances calling for development could be set out as follows:

(a) A large landing is not in a main shipping harbour, but is relatively well protected from weather
(b) The landing is an important point for supplying fish to the domestic market

(c) Some 60 canoes are based on the landing and 100 per cent mechanization with outboard motors, introduced through a government loan scheme, has taken place over several years

(d) Since mechanization has been introduced, the production has trebled over four months in the main season, and has considerably increased over the balance of the year

(e) The Fisheries Department has introduced a conventional type multi-purpose vessel of 12 m (35 ft) with an appropriately powered diesel engine, which is more efficient than the canoes and has a far greater range. These vessels are being supplied to successful fishermen through an extended government loan scheme

(f) The vessels have a one ton capacity ice box but could conceivably land up to two tons from a fishing trip of one to two days. (The existing canoes cannot carry more than 453 kg (1,000 lbs) with gear)

(g) It is anticipated that 30 canoes will be replaced by the new vessels over a five-year period

(h) The present canoes land along a beach in an area 800 m (½ mi) long which constitutes the market

(i) Power and water are avilable close to the main landing area.

For the new vessel operations to be successful, it is obvious that the scheme must have both service facilities, and improved marketing for increased landings. The larger vessels will not be able to be beached and the landing of catches, refuelling, etc., will be most inconvenient.

Production surveys must have been carried out to ascertain present production and a forecast made of the likely increases. This should be related to the resources and the likely sustained yield of fishing grounds within the range of the new fleet.

Two sections of facilities

The facilities necessary for developing the port can be divided into two sections although these are interdependent when related to the catch:

(a) The necessary services for the vessels

(b) The handling of the catch and all aspects of marketing.

To provide both these services, centralization is vital. Under (a) the following must be planned:

(i) Berthing facilities to facilitate unloading of catches and loading of gear and supplies

(ii) Fuel and water

(iii) Ice

(iv) Workshop, repair and maintenance facilities including the provision or availability of a slipway or the means of carrying out underwater maintenance

(v) An area available for gear repair and storage.

Under (b) an area of land large enough to accommodate foreseeable development as close as possible to the jetty or dock including:

(i) A market building adjoining the jetty or dock

(ii) An ice-making plant with ice storage or a readily available ice supply

(iii) Fish cold storage rooms

(iv) Easy vehicle access and parking space

The selection of the site to a degree will be dependent on available water frontage and land and conformity with town planning besides meeting conditions of weather for the safety of the fleet. Such a fishing port development may be planned for phased development, by meeting the most urgent needs first, and it is always the case in developing inshore fisheries that changes from traditional methods will be necessary.

Sources of financing and management

In the example being considered, it is very unlikely that finance for port development will be available from the industry, as the financing of vessels is itself to be made available from government sources or with government backing. The chances are that the government will have to provide the total finance, as the whole development is in the national interest, and can be classed as a long term investment in the fishing industry.

Vested interests in the private sector, such as oil companies, may be willing to provide some capital or infrastructure in exchange for certain trading rights, but in such cases the infrastructure should conform to the overall plan.

It is unrealistic to expect that port development works such as jetties or docks for an inshore fisheries port will be self-amortizing. On the other hand, well managed markets, slipways and workshops should pay their way.

Management for these types of facilities can pose a major problem. Co-operative management from within industry is rarely successful without supervision and guidance over a number of years.

In many countries, the local authority (town or village councils) are the traditional operators of all markets. This authority covers the enforcement of health and sanitation regulations and collection of market dues from individual stall holders, traders and general users of the market. These markets are not operated as businesses, but as public utilities providing a source of revenue. Therefore, the experience necessary for the management of a small port, a wholesale fish market with an iceworks, a slipway and service facilities are not likely to be available from the town authority.

A not unusual solution to this problem is to place the management under an existing government statutory board already involved in other marketing such as an Agricultural Marketing Corporation or a State Development Corporation or create such a board to manage the port and markets. Alternatively, the different facilities may be leased out on contract for private enterprise operation and management.

INSTALLATIONS IN ESTABLISHED HARBOURS

A fisheries based on a major shipping harbour may face many difficulties in port development. First the port will have been developed over a considerable period and expanded with general economic growth. In all harbours, water frontages are at a premium as many industries are best sited with access to water. In all probability, the future development of fisheries has not been considered.

This means that when the time comes to provide essential facilities for an expanding fishing industry many, if not all, of the easy and accessible frontages suitable for a fishing terminal will have already been taken up.

A major port will service a major city and will be the terminal for distribution to all large centres in the surrounding area. As such, most services necessary for a fishing port will be available and the markets for increased fish production for either fresh, frozen or processed fish should be easily accessible.

To gain a place in the overall port plan **the priority for fishery development must be firmly established as soon as possible,** otherwise any existing occupancy by the locally based fleet will be continually under pressure by other competing industries.

The late, and often slow development of a fishing industry, puts it at a disadvantage to well established interests for a site in a port.

The final decision will have to come from the highest government level and for such a decision to be made the supporting evidence must be factual and based on a sound knowledge of the available fish resources, the incentives to exploit them such as markets or export and the likely future investment in the industry.

The resources

The available resources as related to fishing port development can be divided into two types based on markets, and although these will be inter-related, they are likely to have a bearing on the priority given to development when considered by a government interest in accelerated expansion of all aspects of the economy.

Certain marine products such as shrimp (prawns), lobsters (crayfish), and tuna, attract investment for the export market. Once a resource of any of these products becomes internationally known, a country stands to benefit substantially from its exploitation both in foreign currency earnings, and earnings through employment and services, whether carried out through local or foreign investment. Resources such as these are likely to raise the priority of fisheries for improved harbour facilities. The ultimate choice of site for basing the fishing operations may depend on government willingness to provide the infrastructure to accommodate a fishing fleet.

The other type of resource is fish for local consumption either fresh, or processed in the short term, but with considerable possibilities of expansion. The priority given to this type of fisheries may be influenced by a number of factors, such as scarcities of animal protein in local diets, replacement of imports by local production, as well as increasing population pressures.

In an established commercial shipping harbour with limited water frontages, it is unlikely that individual fishing companies can be allotted their own frontage for development; therefore, considerable planning is necessary to provide adequate facilities which will meet the needs of the industry as a whole. This particularly applies to wharfage.

Required information

The case for harbour development must be carefully planned for presentation. This under normal circumstances will be the responsibility of the Fisheries Department, and all relevant information on the existing situation must be collected, and future expansion forecast.

The information necessary for the presentation would include:

(a) Number and type of vessels using the port: classified according to size, draft, and types of fishing being carried out
(b) Production, broken down into its utilization, such as, shrimp for processing and export, fish for fresh marketing, fish for processing, etc.
(c) Frequency of unloading for each classification of vessel, time spent at sea and time in port for unloading and preparation for sea
(d) Servicing requirements, fuel, ice, stores, etc.
(e) Marketing arrangements, including the average number of buyers, their various classifications and quantities handled
(f) Transport and distribution arrangements
(g) Existing fish handling premises, either marketing, storage or processing and their location

From this information, the type and size of the facilities can be worked out with ample allowance for expansion depending on the size and extent of the marine resources and the future requirement of the country for fish.

Forecasting future development

The changing pattern of world fisheries over the last decade, with the introduction of distant water refrigerated vessels, and the factory or mother ship concept, opens up a completely new source of supply to developing countries if the markets are available. This must also be considered in the planning of port and market development.

It is not intended in this paper to go into the administrative machinery for proceeding with fishing harbour development; this must vary by country. The intention is to stress the needs and extent of the components which are necessary for this type of development. These will be the same for new port facilities in an existing harbour, or a completely new harbour, although there are likely to be limitations in the first by reason of available water frontage and adjacent land areas for fishing industrial development.

Likely requirement of the port

The purpose of the fishing port must be the most efficient turn round of vessels, which includes unloading and access to land based services. Most of the developing countries are in the tropical zone which calls for extra care in handling marine products. Marketing is generally in the hands of a large number of small traders with few, if any, facilities. This calls for extra space in a wholesale market, both to accommodate a large number of buyers, and to provide facilities for cleaning, packing and dispatch with adequate parking. Ice and cold storage are essential in any marketing complex. Remembering that fisheries are in the early stage of development, it is unlikely that there will be many established wholesale depots or processing plants. To provide improved and extended marketing of marine products, these types of facilities will grow with the industry. It is therefore, most important to plan for an extensive fishing industrial area. This should be located as close as possible to the landing point, preferably adjacent to it. Included in the industrial area, provision should be made for all fleet servicing, including workshops, gear supplies and storage

With the number of people involved in maintaining a fleet, marketing, distribution, etc., adequate public utilities such as toilets, wash rooms, and possibly a hostel and catering facilities must also be provided.

A new expanded industry will require a great number of trained personnel both for sea service and the associated industries ashore. These training facilities could well be located within the complex and should be considered in the overall planning.

The whole area for fishery development must finally be linked to the other services in the harbour and town or city. All types of transport will be involved and in considerable numbers. This means that access must be convenient and fit in with planned highway development.

A major wholesale market and fish processing plant will provide an outlet for smaller fisheries based within transport distances of the harbour. Provision must, therefore, be made for receiving fish by road or possibly rail transport. Receiving, weighing, sorting, packing and sales for this fish must be integrated with the "flow through" of fish landed from the docks. The market should be so designed, that each operation of the market progresses from the point of arrival through to dispatch with such items as containers and ice being available at the appropriate points. This will minimize congestion and permit better control of each operation.

If frozen fish is landed, it should by-pass the fresh fish wholesale market and go direct to cold stores. Depending on the traditional products of the country, provision may be necessary for a separate market for processed fish such as smoked, sun-dried, or salted products.

Modern fish marketing and distribution demands the best possible communication mediums. Ship to shore radio is an essential for large vessels unloading bulk catches. Telephone services on land can greatly assist in gathering market intelligence. These communications media should be set up within the market complex in any new fishing port development.

The finally selected site must confirm with town planning and in all ways conform to health and sanitation rules governing the location.

FISHERIES DEVELOPMENT POLICY

The decision to undertake major fishing port and market development, either to accommodate a growing local fleet, a foreign fleet exploiting a particular fishery, or in order to attract investment into the industry to exploit known resources and provide a base for a processing industry, must be taken at the highest government level because of the financial commitments involved.

Apprehension is invariably expressed by inshore fishermen as to the ultimate effect on their livelihood of a large-scale industrial type fishery. Provided there is a parallel development at the smaller landings, such as provision of ice and other essential facilities, the inshore fisherman stands to gain substantially from the new outlets and markets created by the landing of bulk catches. Almost every inshore fishery has a glut period, and, because the period is generally short and inconsistent, it does not warrant the provision of expensive holding facilities which will be under-utilized during the greater part of the year.

The type of facilities which are required in a new fishing port would be such that local gluts can be handled and absorbed at an economic price and thus provide a much more stable income to the small-scale operator.

Development of Fishing Ports and Port Markets in the Indo-Pacific Area

by G. N. Subba Rao

Developpement des ports de pêche et des marchés portuaires dans la région indo-pacifique

L'auteur passe en revue les problèmes du développement des ports de pêche et des marchés portuaires dans la région indo-pacifique. L'industrie reposant principalement sur des bateaux de pêche de taille relativement faible opérant à partir de bases très dispersées, l'implantation d'un certain nombre de petits ports de pêche bien situés et disposant des installations annexes indispensables contribuerait à la concentration de l'activité halieutique en ces points et favoriserait en fin de compte sa modernisation. La communication insiste sur la nécessité d'études préliminaires approfondies—site, courants, taux d'envasement, etc.—avant la mise en route de tout travail de construction.

Construcción y mejoramiento de puertos pesqueros y mercados portuarios en la zona del Indo-pacífico

Se examinan los problemas suscitados por la construcción de puertos pesqueros y mercados portuarios en la zona del Indo-pacífico. Como la industria está basada principalmente en embarcaciones de pesca relativamente pequeñas que operan desde centros muy diseminados la existencia de pequeños puertos pesqueros en lugares adecuados y dotados de las instalaciones y servicios auxiliares necesarios, ayudaría a concentrar la industria en tales puertos y, en su caso, a modernizarlos. Se pone de relieve la necesidad de efectuar un cuidadoso estudio preliminar del emplazamiento, movimientos de las corrientes, ritmo de sedimentación, etc., antes de llevar a cabo obras estructurales.

THE fishing industry in the Indo-Pacific area operates at different technological levels in the different countries and the development of fishing ports in the emerging countries of the area presents certain characteristic features. In most of these countries, the industry is widely scattered and the types of fishing craft employed vary from 5 m (16 ft) long catamarans to 25 m (82 ft) long trawlers. However, most of the boats are small and are engaged mainly in the exploitation of the inshore resources. The industry is based on individual or small-scale units and there are very few big companies. The modernization of the industry is largely hampered by a lack of the essential facilities such as landing centres, wholesale markets, ice supplies, repair and maintenance services, navigational aids, etc. The boats do not sail to the more distant but productive grounds because of lack of shore-based navigation and communication aids. Limited experience in the area, particularly in Hong Kong and Karachi (Pakistan), has shown that provision of a fish harbour and ancillary facilities has generally resulted in the centralization of the industry, and the growth of other related industries around the area such as ice plants, machine shops, boatbuilding yards and processing factories, to the benefit of the fishermen. FAO, through the Indo-Pacific Fisheries Council, has continued to impress on Member Governments the importance of providing the necessary developments such as modern fish harbours and ancillary facilities to assist the industry's growth.

RECENT DEVELOPMENTS

Some factors which hinder growth in the region are:

(a) Small fishing units operate from widely scattered centres
(b) Majority of the craft are small and normally do not draw more than 1.5 m (4 ft 6 in); (a good percentage of the craft are motorized but oar and sail propelled craft still predominate in many of the countries)
(c) Small fishing boats land their catch at improvised points such as river mouths or small coves which have no facilities for on-the-spot handling or marketing. At most of these places, landing is generally possible only during the high tide and in most cases, fish have to be transhipped to shallow draft barges for landing
(d) The collection of fish, its transportation to markets and the actual marketing is done by middlemen and the fishermen have largely to depend on these middlemen to dispose of their catch.

During recent years, FAO has been associated with important developments that have been taking place in some of the countries in regard to fishing ports and port markets.

In Pakistan, a fish harbour was constructed more than ten years ago. Provision was made for accommodating about 300 boats.

Another project with which FAO is closely associated is in India. Three experts under the UNDP/TA program carried out a survey of 28 possible sites for fish harbours. This has now resulted in a UN Special Fund Project for a pre-investment survey of the sites before actual construction is undertaken.

Other recent developments are in Ceylon and Singapore. In Ceylon, a number of small fish harbours and two large harbours are being developed. The small harbours are at Mutwal (Colombo), Beruwala, Mirissa and Tangalle. These will accommodate boats of about 2 m draft (at Mutwal larger boats can be accommodated) and are provided with a reinforced concrete wharf. The shore installations will include a hall for auction and repacking, an ice plant and a small cold store. The larger fish harbours are being developed within the already existing commercial harbours at Galle and Trincomalee. The Galle harbour is expected to be finished within about two years. It is to be developed as a major tuna fishing base in the Indian Ocean. The proposed shore facilities include a large wholesale market, processing factories, a 2,400 ton cold store (−20°F) (−6°C), 15 tons/day freezing capacity, and an ice plant with a capacity of 50 tons/day. In Trincomalee which is also to be developed as a major fishing port, it is proposed to provide a 300 ton cold store, 50 ton store for fresh fish, ice production capacity of 60 tons per day and a freezing capacity 10 tons/day.

In Singapore, a large fishing port as an annex to the commercial port has just been completed and is able to handle ocean-going vessels. A wholesale market and ancillary facilities are provided.

PROBLEMS OF DEVELOPING COUNTRIES

The problems associated with the development of fish harbours and wholesale markets in the Indo-Pacific area are many. Selection of the site is important and may usually have to be at a river mouth or at a small natural harbour with surrounding fishing villages, or it may form a part of a larger commercial harbour capable of accommodating larger draft vessels and having large hinterland urban markets. In a few south-east Asian countries river mouths afford a convenient site for fish harbours mainly because fish is transported by water to upcountry areas.

Before constructing the harbour installations, the problem of silt deposition should be carefully investigated. In one country in this region, during the last three years, a number of small fish harbours, mainly to accommodate boats drawing about 2 m (6 ft), have been constructed without any experimental studies of the design, silt load of the water, current movements, movement of bottom deposits, etc. The result has been that within a year, some of the harbour basins are being heavily silted up and are in danger of being completely filled up. This means that expensive periodic dredging will be necessary. Detailed preliminary investigations are therefore very essential, before constructional work is undertaken. The other problem is communication between the landing centre and the consuming centres. The development of new fishing ports will have to go hand in hand with development of road communication.

Facilities required

The basic functions of a fish harbour and its ancillary facilities will be to provide for:

(a) landing of the catches, preferably directly into the wholesale market
(b) berthing of the boats for refuelling, re-icing, etc. in preparation for a new voyage
(c) maintenance and servicing of the hull and engines.

The ancillary shore facilities may include:

(a) a wholesale market for fresh fish
(b) cold storage for holding fresh and frozen fish, and a freezing plant
(c) wholesale markets for freshwater fish as well as for dried and salted fish
(d) salted and dried fish stores
(e) fish curing yards where fishermen or their families can individually or collectively salt and dry fish under hygienic conditions
(f) space for fish processing plants such as boiling, smoking, fish balls and sausages, etc.
(g) ice plants and loading and unloading equipment
(h) fish boxes and baskets manufacturing facilities
(i) a slipway
(j) a fuel terminal
(k) workshops
(l) social amenities to the fishermen
(m) road and where necessary, rail siding to facilitate distribution to upcountry markets
(n) navigation and communication aids for assisting vessels on the sea.

Types of harbours

The types of fishing ports and shore facilities that are likely to be required in the Indo-Pacific region during the next five years generally fall into three categories depending on the type of boats, the location of the fishing villages, and the hinterland urban markets.

One type of facility would serve groups of small villages where fishermen still rely on oar and wind propelled craft, or craft propelled by small outboard engines. In spite of motorization and the introduction of improved craft, the traditional types of craft will continue to exist for a long time. The location of landing facilities will usually be at a river mouth or in small protected coves. The structural work will involve the construction of a small quay where the fish can be landed. The shore facilities should include a small flake-ice plant, a cold store, a net making and drying facility, roads, a hygienic fish curing yard and where warranted, a small wholesale market which can be run by the fishermen's association or a co-operative.

Another type is a small fish harbour which can accommodate mechanized boats drawing up to 2 m (6.6 ft) of water. A somewhat longer quay will be needed or, where necessary, finger-like jetties will have to be provided. The quay should preferably have three sections—one at the wholesale market where fish can be directly landed from the boat, one for the preparation of the boat for a new voyage such as loading of ice, refuelling, etc., and the third one for berthing of boats in the basin.

The shore facilities for such smaller fish harbours will include a wholesale market, ice plants, cold stores, fish curing facilities, servicing and maintenance facilities, fuel depots, navigation and communication aids, etc. A number of harbours of this type have now been constructed or are under construction in some countries of South Asia. It is likely that the new fishing ports and port markets in South East Asia will be largely of this type during the next few years.

The third type of fishing port is the large one capable of accommodating boats of 6 m (20 ft) or more draft. At present, fishing activities in this region are generally confined to coastal areas but deep sea fishing is now being taken up on a commercial scale particularly in Ceylon.

At present, the need for this class of fishing port in southeast Asian countries is limited but will increase in the near future as the average size of the boats in the fishing fleets becomes bigger and the industry has to look to the more distant grounds for increasing production.

OPERATION OF FISHING PORTS

In countries with more developed fisheries, a large number of ports and port markets are regulated by fishermen's co-operatives or associations as in Taiwan, Japan and Korea. In Hong Kong and Thailand, autonomous marketing organizations sponsored by governments operate the markets. The Karachi fish harbour and wholesale market is operated by the Fishermen's Co-operative Society which has more than 3,000 members. In the developing countries, if there is a well developed fishermen's co-operative or association, the markets, particularly in the smaller fish harbours, could be handed over to these organizations who will operate it in the best interests of the industry. If there are no well developed co-operatives or associations, a government-sponsored marketing agency or corporation could take over the market operations until the time when fishermen's organizations attain a level where they can take over.

Considerations in the Planning and Design of Fishing Ports and Landing Places

by

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Considerations sur l'organisation et la conception des ports de péche et des centres de debarquement

Les auteurs ont rassemblé des notes qui reflètent l'expérience acquise concernant certains problèmes de génie civil apparus lors de l'aménagement de petits ports de pêche.

Les centres de débarquement de conception simple continuent de rendre de grands services en nombre d'endroits, et il peut suffire de légères améliorations pour encourager les initiatives et révéler des avantages qui, dans les sites les plus favorisés, justifieront peut-être une expansion des installations permettant l'emploi de navires modernes. En matière de génie civil, le port idéal doit notamment répondre aux quatres conditions suivantes: constituer un havre sûr, accessible même par mauvais temps; être assez profond et spacieux; être doté d'ouvrages d'accostage adéquats; disposer d'une surface à terre suffisante. La condition primordiale, à savoir sécurité et accessibilité par tous les temps, revient très cher si on doit l'obtenir artificiellement, et toutes les solutions découlant du choix d'un site peu satisfaisant à cet égard—bassins avec portes on estacades flottantes, emploi de slipways ou d'élévateurs du type "synchrolift"—présentent des inconvénients.

Lorsqu'on désire procéder à l'approfondissement d'un port, la prévision des besoins doit se faire à long terme et être généreuse, car une nouvelle reprise en sous-oeuvre ou un nouveau minage peuvent revenir extrêmement cher et présenter de grandes difficultés si le trafic est intense. Lors de l'approfondissement, le gros des frais peut provenir du soutènement des murs de quai existants. Le choix de la méthode peut dépendre souvent de la nécessité d'améliorer certaines autres caractéristiques du port. Lorsqu'on évalue le coût de l'approfondissement, il importe de tenir compte des dragages périodiques d'entretien, dont les frais doivent entrer dans le calcul du coût réel. Le dragage offre souvent le moyen le moins onéreux d'assurer la praticabilité d'un chenal d'accès sur un littoral sableux.

Il importe de disposer d'une surface à terre suffisante pour le trafic, l'emmagasinage, et autres activités liées directement ou indirectement au port. Il ne faut pas qu'une expansion ultérieure soit freinée par le manque deplace.

Si l'obtention de renseignements complets sur le site risque d'être lente et coûteuse, elle revêt néanmoins une grande importance, car emplacement ou conception du port peuvent difficilement être modifies ultérieurement.

Les travaux sur modèles réduits sont extrêmement précieux, qu'il s'agisse d'obtenir une image d'ensemble ou de confirmer un détail du plan: en fait, pour certains sites, ils sont presque indispensables.

Consideraciones sobre la planificación y diseño de puertos pesqueros y desembarcaderos

Se trata de una reunión de notas sobre la experiencia del autor en algunas cuestiones de ingeniería civil que han surgido al construir y mejorar pequeños puertos pesqueros.

Los desembarcaderos sirven todavía para el desempeño de útiles cometidos en muchos lugares y las pequeñas mejoras puedene stimular a las empresas, revelando otras ventajas que, finalmente, en los mejores emplazamientos pueden justificar su ampliación para barcos modernos. Cuatro de las condiciones que requiere la ingeniería civil en relación con un puerto ideal son las siguientes: un refugio seguro accesible en condiciones de mal tiempo; suficiente espacio y profundidad; buenas instalaciones de atraque; suficiente espacio en tierra. La condición más importante de un puerto, esto es la seguridad y accesibilidad con cualquier clase de tiempo, es muy costosa de obtener artificialmente y las otras possibilidades, es decir, el aceptar un refugio inferior al que se considera ideal, muelles provistos de esclusas o plumas de cargar y de varaderos o elevadores de embarcaciones, poseen sus proprias dificultades.

Cuando hay que profundizar un puerto, el pronóstico acerca de sus necesidades debe hacerse considerandolo para largo plazo y de un modo amplio ya que su posterior apuntalamiento o voladura del existente pueden ser bastante costosos y difficiles en un puerto muy activo. La mayoria de los costos ocasionados por los trabajos de profundización es posible que se debar al de reforzamiento de los muros de los muelles existentes. La elección del método va unida frecuentemente a la necesidad de mejorar algunas características del puerto. Al estimar el costo de los trabajos de profundización es importante tener en cuenta el costo del dragado ya que el costo real debe incluir esta cantidad capitalizada. El dragado es posible que sea el modo más barato de mantener un canal a través de una costa arenosa.

En tierra debe existir suficiente espacio para el tráfico, el almacenamiento y las actividades directa o indirectamente relacionadas con el puerto. La ampliación no debe encontrar dificultades por falta de terreno.

Una amplia información sobre el lugar del emplazamiento puede ser lenta y costosa de obtener, pero es importante disponer de ellas a causa de la dificultad de efectuar cambios posteriores con respecto al emplazamiento o diseño.

Los modelos son muy valiosos ya sea para tener un cuadro general o para confirmar un detalle del diseño; en ciertos lugares son casi esenciales.

THE Office of Public Works is the Government agency responsible for, *inter alia*, the maintenance and administration of State-owned marine works—principally the three State harbours at Dun Laoghaire, Howth and Dunmore East, each of which includes an important or predominant fishery harbour unit—and for a wide range of smaller works, used mainly for fishing purposes, along the Atlantic seaboard of Ireland. The Engineering Branch (Marine Division) additionally plans, designs and constructs marine works for other Government Departments—in particular for the Department of Agriculture and Fisheries and the Department of Transport and Power. The Office also advises these Departments on schemes of harbour development submitted by local harbour authorities and other bodies seeking Government aid, technical or financial, for such schemes. The Office is thus concerned with the whole 1,100 km long seaboard of the State.

This paper is concerned only with the smaller marine works used by fishing vessels and fishermen. It does not purport to describe the various forms of construction or techniques used in marine engineering. The paper is rather intended as a collection of notes, to draw the attention of engineers and others concerned with the planning or design of fishing ports and facilities, to certain considerations which have come to the attention of a group of engineers engaged for many years in this field, and which may not immediately occur to the designer of such works at the preliminary stage.

Fishing ports vary greatly in size and importance. At one extreme they can be centres of international fishing activity, equipped to deal with every aspect of fish catching, handling, marketing and processing, and to meet all the needs of fishermen and fishing vessels. At the other extreme a fishing port may be little more than a simple landing-place; a cleft leading to an otherwise inaccessible shore, a strip of smooth beach or a short length of rough quay wall with a few hundred square metres of working and storage space

The small and primitive landing place should not be despised. A great number of fishermen have nothing else and a vast volume of fish is landed at such places throughout the world. Even the smallest and most remote places may have a contribution to make to the economy, and it is frequently the case that the varieties of fish most in demand and selling at the highest price come from such ports. Quite often they are reasonably adequate for the landing of fish or the safe-keeping of boats and in the past there was little demand, or indeed need, for facilities on land. Now, space around the landing places and the approach roads thereto have become quite inadequate for modern usage. Additional space ashore and road improvements are generally cheap to provide by comparison with marine works in tidal waters. By encouraging enterprising fishermen quite simple improvements may suffice to reveal the natural advantages of a site. Fishing activity will grow, one improvement will be followed by another, a community will form and before long some major development work may become economically justified.

IDEAL PORT PROVISIONS

The ideal port, fishery or otherwise, will provide many things. This paper deals mainly with four:

(a) safe refuge accessible in bad weather
(b) sufficient depth and room in the approach and anchorage
(c) satisfactory berthing facilities
(d) adequate shore space around the harbour

There are other factors of great importance of which proximity to good fishing grounds, satisfactory land communications, commercial facilities and social amenities near the port, well-organized marketing arrangements are a few.

The ideal will not often be attainable and compromise will often be necessary, but the four basic needslisted above must at least remain constantly in the planner's mind.

SAFE REFUGE ACCESSIBLE IN BAD WEATHER

The first need of every fisherman is a safe harbour; somewhere to bring and keep his boat where he can be confident that it will be secure, whatever the weather, with the minimum of attention. The ideal harbour of refuge will be safely accessible in any weather. Once inside, the vessel will lie in calm water, riding to normal moorings or alongside a quay without any tendency to range and chafe against fendering. In a natural harbour of refuge such conditions will be provided by a long approach channel or, if close to the open sea by an entrance narrow in relation to the area of enclosed water within. Such conditions are costly to provide artificially. Because the entrance must be wide enough to allow of safe and easy passage in bad weather the basin, for even a few small boats, must be relatively large in order to give adequate spending area for waves penetrating the harbour. For a small fleet a large artificial basin is thus clearly out of the question economically. Two alternatives are available if the boats are to remain afloat:

(a) to accept less than ideal conditions; or
(b) to provide a removable barrier in the entrance to a smaller basin

Each solution has its dangers, both of a psychological rather than an engineering nature, and it is with this aspect of the problem that these paragraphs deal.

The too-small basin can create a sense of false security. Boats may be left safely afloat for months or even years; then a storm—exceptional in either strength or direction —occurs and boats at anchor are damaged or lost. Even if such harbours are used only for good-weather fishing, an unpredicted gale can be disastrous.

Fate of latecomer

The moveable barrier—dock gate or booms—presents a different problem; that of the fate of the latecomer. Tempted by good fishing, optimism or failure to read the signs or listen to the weather forecasts, the latecomer arrives at his home port to find that the entrance has been closed. Closure of the entrance cannot be deferred too long or the operation becomes hazardous or impossible, and boats already within will be damaged or destroyed by entering seas. On one occasion in the West of Ireland dock gates already closed were opened in response to the pleading of a late arrival and were smashed, together with all the boats already sheltering inside.

If possible, the entrance to a refuge dock should be located so that boats unable to gain admission have room to alter course at a late stage and return to deep water; they can then at least seek an alternative shelter. The entrance should be given as much protection from wave action as possible both for the safety of entering vessels and of the barrier itself, by careful siting, supplemented if necessary by an artifical breakwater. An effective breakwater is, however, likely to be extremely costly. The possibility of the failure of the barrier in a severe storm clearly cannot be tolerated. It may be noted, however, that the barrier need not be watertight, since its purpose is to keep out waves and not water.

Where no other solution to the problem of providing safe anchorage afloat is practicable, the limitations of a dock must be made very clear to all concerned.

Removing small boats from water

Where neither natural shelter, practicable artificial harbour nor refuge is possible or economically practicable, a partial solution for small craft may be to provide some means of removing them from the water. This is, of course, the small boat owner's normal response to the threat of a storm. The traditional method of getting a small boat out of the water is by some form of slip, which can be anything from a sandy beach to the modern sophisticated slipway with power haulage and elaborate cradles. As a form of refuge from storm, the first-mentioned version of the slip, a beach of unlimited width and the means of handling several boats simultaneously, whether by manpower or winches, has much to commend it. Any slip which can accept only one boat at a time, however highly mechanized and streamlined in operation, must be suspect if it is to be used in rough weather or in an emergency for hauling numbers of boats ashore.

Loading a boat on to a cradle, so that as it leaves the water it is held securely upright, without strain or local damage to the hull, is quite practicable, although a delicate operation even in conditions of calm water and unhurried handling. The same operation carried out in disturbed water, possibly at night, urged on by a queue of late arrivals well aware that conditions are worsening, is very different. A quite minor accident in slipping a vessel, or in the subsequent handling of it, could easily block the slip for many minutes with disastrous results to the waiting boats. If a slip of this nature is proposed as a means of providing refuge, it is imperative that its limitations should be clearly understood and accepted.

The gradient of a slip is important. Too flat a slope reduces effort, hand or power, but prolongs the operation. It may also make launching difficult and the structure will occupy unnecessary space. If the slip is too steep, hand movement of even the smaller boats becomes impossible. Experience would suggest a gradient of approximately 1 : 8, or 12½ per cent, as a satisfactory compromise for vessels up to 12 m in length (40 ft). Where a simple ramp is required for the movement of boats by hand, a surface in the form of wide shallow steps with rounded noses is safer and easier to walk on and push from.

Small boats have from earliest times been lifted in and out of the water by some simple form of crane, or by davit. Some engineers who are not also seamen faced with the problem of providing refuge for fishing boats, are attracted to the idea of a crane. The problem of attaching a heavy crane hook or a sling to a rolling and pitching vessel in worsening weather, perhaps in the dark, without injury to either the boat or the men concerned, must rule this method out as an emergency operation.

Two modern devices

Two recent developments, a submersible boat-platform, and an overhead gantry carrying slings which are lowered into the water and over which the boat moves and is lifted, cradled in these slings, would seem to offer advantages for the removal of boats rapidly and safely from calm water, and would take up little harbour space. Although these operations are less costly and less time consuming as a solution to the problem of removing boats from the water in an emergency they must be ruled out for the same basic reasons as the mechanical slip.

When the development of a small landing-place calls for the installation of new equipment, it is tempting to select power-operated plant—winches, cranes or slips—rather than hand-operated machines. Mains power, if available, has the advantage of giving instant starting with the minimum of attention, but power failure is not impossible and is more likely at times when the equipment may be most urgently required. Some stand-by should be provided; hand-operated gear may be acceptable as a stand-by for certain duties, for example for a crane to handle booms, to close a dock entrance, which may be in use for only short periods a few times a year.

Maintenance of the equipment to keep it ready for duty and operationally safe, for the benefit of all, is most important. The responsibility for this duty must be allocated clearly to a competent individual; with any elaborate plant, full-time operators should be appointed. It is particularly important to ensure that where a slip or crane may have to be used in emergency conditions it should be immediately ready for duty, and that firm and fair control of the facility will be provided to avoid panic.

SUFFICIENT DEPTH IN APPROACH AND ANCHORAGE

The commonest improvement demanded within a harbour is greater depth. It pays to be liberal in this respect. Deepening by stages at intervals of time is much more expensive than if carried out in one operation because amongst other things it necessitates bringing costly plant on to the site for a second time. It also disorganizes the operation of the harbour while deepening is in progress. Moreover, if the surrounding area has developed since the initial improvement it may be necessary to use explosives in an inefficient way to avoid damage to buildings or structures. Inevitably also there will be a long interval between the appreciation of the need to deepen and the completion of the work; the consequent uncertainty and delay may restrain fishermen from procuring more modern vessels.

For these reasons, any forecast of the requirement of boats using a harbour, and of the expansion of the harbour itself, should be long-range. The engineer will then be able to plan and execute the work with possible future developments in mind. For example, quays not on rock should be founded deep enough to minimize the need for subsequent underpinning. Again, when the harbour bed is rock, it may be worthwhile to drill and blast—but not necessarily to remove—the rock to a greater depth than the dredged level immediately proposed. The cost of such additional blasting work is relatively small when all plant is already on the site.

A point which might be examined is whether it is essential to deepen the whole harbour area to provide flotation at all times for the deepest draught boat using the harbour. It is convenient for fishing boats to be able to lie afloat at all times alongside a quay, but once they have landed their catches and taken on necessary supplies they can move out to moorings. Off the West and South coasts of Ireland, where mean spring tidal range is in the region of 3½ m (11.5 ft) low water of spring tides occurs at about mid-day or midnight. For vessels which leave port daily in the early morning and land their catches in the evening, a very usual practice, it may be acceptable to provide flotation in berths for low water neap tides only, thus saving up to a metre of excavation. In this case the boats would move over to deeper naturally protected moorings for the low water spring periods. Steps in a harbour bed are, however, undesirable and should be avoided if possible, unless the saving is considerable.

So-called "dry land" piers, extending only down to low water, have been often criticized but they are in fact in good company—if on a very different scale—with many ports where ships must await high tide before entering or leaving. These piers serve a useful purpose if the activities for which they are mainly used can be deferred until mid or high tide.

Deepening some areas

Deepening may be proposed in order to lengthen the period of flotation for boats which can be allowed to take the bottom on soft material at low water. A shallow deepening which would expose rock is undesirable and, if such deepening is essential, then a sufficient depth of rock should be removed in order to accommodate a layer of soft material (which may have to be introduced artificially) and to allow for economical maintenance dredging.

In estimating the cost of any deepening, the cost of future maintenance is clearly important, since the real cost of the deepening is the initial expenditure plus the capitalized cost of maintenance dredging.

Most fishing harbours will have to rely for maintenance dredging on periodic visits by a dredging contractor. Where the quantity of material to be dredged is relatively small the cost of bringing the plant to and from the site will be a high proportion of the total cost of the operation. It will therefore sometimes be economic to overdredge on each occasion in order to reduce the frequency of visits. It follows that where the initial deepening is in rock, some rock excavation below the level necessary to provide flotation may, in the long run, prove profitable, since it will permit this economic overdredging.

On keeping channels clear

Maintenance of a channel across a sandy coast presents special problems. Normally it is achieved by regular dredging. But repeated heavy expenditure, apparently necessary in perpetuity, is understandably repugnant to a harbour authority and any alternative method offering hope of a permanent solution is attractive. If the channel is to be maintained at a depth significantly greater than nature provided, it is unlikely that there is a cheaper method than mechanical removal of material. Fixed structures, aimed at preventing shoaling in the channel or harbour mouth, have often been tried. For example, a training wall may be extended to cut off or deflect littoral drift and may make dredging unnecessary for some years but, normally, drifting beach material will ultimately reach the end of the extended structure, causing shoaling again, while in the meantime an erosion problem may be created elsewhere. Structural works could no doubt be designed to eliminate siltation for a long time, but it is likely that they would be so large that the cost of financing and maintaining them would greatly exceed any expenditure on regular dredging.

In a number of piers, built generally during the last century in Ireland, a bridged opening was left near the root, to permit the free passage of drifting beach material which would otherwise be trapped by the structure, causing local siltation. So far as the authors are aware, this device has not been effective in reducing the siltation.

Artificial scouring of channels—water being held up and released at low tide—has been tried with disappointing results, probably because the storage available was insufficient to produce adequate velocities to move deposits into deep water.

While the regular removal of accumulated material from a channel across a sandy coast will probably have to be accepted, alternatives to orthodox dredging plant are worth considering. Dredgers are very costly to build, man and maintain. If accumulated material is found to be entering a channel by a relatively narrow and well-defined route, the possibility of removing it by land-based equipment should be considered. A machine manned by a small crew, mounted on rails on an open-work gantry, easily withdrawn into shelter and less dependent on weather than floating plant, would cost substantially less to purchase and operate than a normal dredging craft and would at least merit serious consideration. If, as is often the case, accretion at one side is accompanied by erosion at the other side of the harbour entrance consideration should be given to the transfer of material across the navigation channel to relieve the erosion.

Very detailed investigations, probably by means of a hydraulic model are clearly essential before solutions of this nature can be attempted.

SATISFACTORY BERTHING FACILITIES

Where improvements to existing berthing or landing facilities are sought, the first consideration is usually the provision of adequate depth alongside. The greater part of the cost of this operation is often in supporting existing quay structures. The choice of method usually lies between sheet piling, a false face, or a widening in open-work with a riprap apron to protect the underwater slope to the lowered berth. This choice is generally determined by local conditions. Buildings may be so close to the quayside and of such a nature as to make the tying back of steel sheet piling difficult. Open-work widening, with riprap, might be attractive if additional spending area to reduce wave action inside the harbour were desirable, but the loss of manoeuvring space resulting from this widening might preclude this method.

In deciding between open-work and solid quays for fishing boats, the need for fendering should be kept in mind. It is probably unnecessary to provide any fendering on a continuous solid face for small boats, since any required protection can be readily provided by tyres hung from the boats. Open-work structures, formed of relatively slender members, will require fendering to protect the structure itself, and also the boat if there is appreciable movement in the berth which should drag the boat out of position.

The fixing of the correct deck level of quays on any site where tidal records are deficient is a matter of difficulty. Abnormal tides due to storm surges can greatly exceed predicted tide levels. A useful estimate of the maximum tide level may be possible if nearby harbours possess storm records, and these may have to suffice until local tidal data have been accumulated. The objections to very occasional overtopping of the deck by abnormally high tides must be weighed against the cost and inconvenience of a large freeboard. Occasional overtopping may be acceptable unless goods or equipment are habitually stored on the quay, or nearby at the same level. With small freeboard the possibility that at extreme high water the belting of a vessel may foul the quay edge or the tops of fenders, should be considered in the design.

The need for providing landing steps for small vessels at a quay should always be examined critically .They may be required for goods traffic or other non-fishing use and probably for landing passengers, but they occupy valuable berthing space and it may be difficult to keep them free for the small boats for which they are intended. In an open-work pier exposed to strong currents where it is necessary to provide steps, safeguards should be provided to prevent a boat, landing at the steps, from being swept under the structure.

ADEQUATE SHORE SPACE AROUND THE HARBOUR

Adequate space ashore is necessary, close to the quays and also further inland, both for port expansion and for those activities that need not take place close to the water's edge. Quay space provided at considerable expense should be reserved for essential quayside services. The most important provision near the quays or wharfs or at the landward end of jetties is open space, so that traffic may move with maximum freedom and accommodation may be available for the handling, sorting, display and high density storage that is inseparable from fishing operations. Where fish is sold by auction at the quay side, halls of adequate area should be provided close to the landing place; no other buildings appear to be needed on the actual landing quay. Fuel tanks should never be located on a pier or quay; oil can easily be supplied through underground pipelines from a distance.

A plea may be made for various buildings and equipment at the quayside, but the question should be examined if the cost of providing - or setting aside - the length of quayside necessary for such purposes would be justified.

Equipment for discharge of industrial fish should properly be located at the quayside because of the large quantities to be handled. Ideally, fish landings for other than human consumption should take place at jetties appurtenant to the reduction plants but separate, and if possible remote, from quays where fish intended for human consumption is landed.

The design of all but the smallest harbours should aim at segregating the several distinct activities of the fishing industry—the landing of fish, the taking on of supplies, emergency and routine repairs, berthage during bad weather or at weekends. All these activities should if possible have their separate places, planned to minimize interference and cross traffic, afloat and ashore. The necessary facilities and amenities should as far as possible be located convenient to the appropriate area of the harbour.

Provide room for growth

Developing fishing harbours, like most other successful enterprises, demand room for expansion both for harbour activities and for the many associated enterprises which will grow round a successful harbour. Even small landing places need space to store fishing gear and many perishable and non-perishable supply items in addition to adequate approach roads and parking and turning space.

As early as possible the harbour authority should acquire as much of the land surrounding the harbour as can forseeably be required, thereby forestalling speculative buying. Early and frequent consultations with the local planning authority is clearly to the advantage of both and the exchange of information on their future intentions can save much time and money. They will not otherwise appreciate each other's special problems. For instance, a scenic road ringing a harbour has obvious attractions aa an amenity and would seem to serve waterside activitiess Unless it is kept well back it may, however, cut off those. activities from essential services or vitally necessary space for expansion, while awkward traffic problems may be caused. On the other hand, easy public access to some observation points near the quays is desirable; the movement of boats is always of interest to visitors, who should also be able to buy fish for their own use directly from small hygienic shops or stalls at the port.

Investigation of sites

Before a marine works project is prepared in detail it is important that a comprehensive site investigation is conducted. Information sought would generally include, in addition to the normal topographical data obtained for any land based engineering work, the necessary hydrographical data, tidal and wave records, meteorological records, data on littoral movements and sedimentation, current patterns over a full range of the tidal cycle and, if in an estuary, river flood conditions. Tidal records should (if possible) be referred to a general or national datum since they may be of use elsewhere. Estimates of forced tides should be made from local information. Aerial photographs are valuable in exhibiting off-shore shoals and wave patterns, and are of great value as records. An automatic recording tide gauge should be installed as soon as possible on any sizeable scheme. This will record night tides, tidal surges and other phenomena which the best staff-gauge reader may miss. An automatic wave recorder is also highly desirable where wave action is an important consideration. However, either of these instruments require careful maintenance; a choked inlet to an automatic tide gauge can give results which, if undetected, will be worse than useless

Unfortunately much of this necessary information is slow and costly to obtain. Nevertheless, the full investigation of a harbour scheme, even if it involves only the development of an existing port, can in the long run save money and result in a more satisfactory scheme. Where the site is new and undeveloped, a full investigation is even more important. Once the choice of a site has been made public it may well be impracticable to make a change to another location and essential changes in design from the normal may be extremely costly. One site in South East Ireland which seemed from a preliminary examination to be eminently suitable for the development of a major fishery harbour, had to be rejected, following detailed investigation, because of difficult foundation conditions and higher than previously recorded local current velocities. These conditions would have at least tripled the original preliminary cost estimates.

Investigation by means of hydraulic models can be extremely valuable; their use should be considered whenever confirmation of an aspect of design or the suitability of a site is required. Models can supply a general picture of a site or they can deal with a single feature, for example, the performance of a storm-wall. They are particularly useful if doubt exists about the degree of protection which can be provided within a harbour, or where ranging is likely to occur in a berth. In a new harbour to be constructed on a sandy coast they are almost essential.

CONCLUSION

Many of these notes have led from the work of this Division during the last decade when it was privileged to work in close co-operation with Mr Carl G. Bjuke, Consulting Engineer from Gothenburg on the preparation of a programme of fishery harbour development in Ireland. His report (Carl G. Bjuke, 1959) will be of interest to anyone concerned with the development of fishing ports and his approach to the subject has been a stimulation to those of the present authors who have worked with him.

Reference

BJUKE, Carl G 1959 Report on the Project of Improvement of Fishing Harbours in Ireland. Government Publications Office, Dublin.

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A Case Study of the Potential for a Fisheries Harbour

by Economist Intelligence Unit Ltd

Etude de la capacité potentielle d'un port de pêche

Le présent document est basé sur l'évaluation d'un projet de port de pêche à Aden et comprend une discussion sur les aspects économiques généraux d'une évaluation des capacités portuaires.

On discute tout d'abord des facteurs affectant la rentabilité du projet tels que la nécessité de travaux de dragage et la disponibilité d'espace pour les constructions, et l'on met en lumière l'importance de prendre en considération aussi bien les ressources potentielles en poisson que l'existence de marchés, locaux ou d'exportation, pour ce dernier, de même que la concurrence d'autres ports. Le document met également en lumière les différences existant entre les ports desservant des marchés à poisson intérieurs et ceux qui travaillent surtout pour les marchés d'exportation. On mentionne également les difficultés que l'on doit affronter pour obtenir de bonnes informations statistiques et des données valables permettant d'évaluer les ressources halieutiques potentielles.

Le document passe ensuite aux méthodes d'évaluation de la rentabilité d'un projet portuaire et fait une distinction entre trois points de vue spécifiques, à savoir celui de l'autorité portuaire, de l'entreprise commerciale et de la communauté. Le document discute l'emploi des techniques de flux comptant escompté pour établir les taux de rémunération des investissements, ainsi que l'emploi de l'analyse des coûts et des bénéfices pour évaluer le projet à la lumière des intérêts généraux de la communauté. Les propositions spécifiques relatives à Aden avaient été calculées du point de vue de l'autorité portuaire, étant donné le manque d'informations adéquates, sur les bénéfices de plus vaste portée. Le document conclut en affirmant que le projet, considéré de ce point de vue, n'était pas viable.

Estudio casuístico de las posibilidades de un puerto de pesca

Basándose en el dictamen sobre un proyecto de puerto pesquero en Aden, se discuten los aspectos económicos más generales del proyecto.

En primer lugar se discuten los factores que afectan a la viabilidad económica del proyecto, tales como la necesidad de dragados y de terrenos disponibles, insistiendo en la importancia de tener en cuenta tanto la riqueza pesquera potencial como los mercados, nacionales o extranjeros, para el pescado así como la competencia que pueden hacer otros puertos. Se ponen de manifiesto las diferencias esenciales que existen entre puertos para mercados pesqueros del interior y puertos para el comercio de exportación; se alude también a las dificultades para la obtención de buenas informaciones estadísticas y para evaluar la riqueza pesquera potencial.

Se consideran después los métodos de valoración de la viabilidad económica de un proyecto de puerto, estableciendo una distinción entre tres particulares puntos de vista: el del propio organismo portuario, el de una empresa comercial y el colectivo. Se discute el empleo de técnicas de descuentos a los pagos al contado para establecer los dividendos correspondientes a las inversiones, y el de análisis de los costs y beneficios para juzgar el proyecto en relación con los intereses generales colectivos. Se hizo un cálculo sobre la propuesta particular relativa a Aden basado en el punto de vista del organismo portuario, por no disponer de informaciones adecuadas sobre mayores benefícios, llegándose a la conclusión de que, desde dicho punto de vista, el proyecto no sería probablemente viable.

THIS paper is drawn from experience gained by The Economist Intelligence Unit Limited (ETU) during a study of the economic viability of a fisheries harbour at Aden, and also considers, in broad outline, the economic approach to the broader appraisal of harbour and port schemes.

The analysis is undertaken in three main stages:

(a) General geographical and physical factors of the project are assessed in so far as they relate to the economies of the scheme

(b) Assessment is made of the economic factors which must be considered in any harbour project

(c) Having considered all relevant geographical, physical and economic factors, economic appraisal is undertaken from three different viewpoints. First, from that of the harbour authority which must run and maintain the harbour and which will levy dues for its use; secondly, the profitability for a commercial enterprise running the harbour, and finally the benefit of the harbour to the community as a whole, requiring the use of social cost-benefit analysis.

GEOGRAPHICAL AND PHYSICAL CONSIDERATIONS

Geographical and physical aspects must be considered in the location of a harbour. Many of them such as the adequacy of shelter, tides, and the direction of winds, are not directly the concern of the economist unless they affect the economic viability of the project by incurring additional costs which might not otherwise have to be met. There are other factors, however, which are of direct importance. The depth of water is one of the most important, for dredging is very expensive. In international fishing with increasingly large vessels such as mother ships and factory ships the requirement is for deep water harbours. In Aden the international fishing companies which were likely to use the harbour all insisted on a depth of at least 6.7 m (22 ft). The cost of dredging to this depth from that of 4.9 m (16 ft) (which was the maximum required if fishing were entirely in the hands of local fishermen) and of maintaining that depth was high and an important item in the overal cost.

The availability of land space immediately adjacent to the harbour is a vital factor. Modern fisheries harbours require sufficient space—for cleaning, freezing, canning and subsidiary processing industries. This factor proved particularly important in Aden where a large proportion of the fish landed would be exported and where the need was for storage while awaiting shipment. Companies in the USA interested in supplies of yellowfin tuna stated that they would definitely want sufficient land space to build cold storage and canning plants.

THE ECONOMIC FACTORS

The most important of the many economic factors to be considered is the potential fish resources in the area. Lack of information on this point proved to be one of the biggest problems in Aden. The convenience of large fishing grounds near the proposed harbour is obvious. Time is more economically spent fishing than travelling to and from fishing grounds, although technical developments and fleets with factory and mother ships have somewhat decreased the importance of this factor. For the appraisal of a single fishing harbour, however, there is the fact that once a fleet moves outside immediate fishing areas it might well consider the use of alternative harbours to land its catch. This is important where a large proportion of the fish landed is for export. The Japanese Fisheries Agency keeps a strict control over all fishing vessels as to where they operate and to what markets they can take their catch. There are additional restrictions on exports by Japanese companies from overseas bases. The overall effect is that the Japanese prefer to fish in the vicinity of large markets for their catches (which Aden just did not provide for them) and where potential catch and sales are large.

The potential fish resources

The statistics that existed for fish landed along the South Arabian coast, both quantities and types, were unreliable due to the system of employing "tellers" estimating the weight of catches. Apart from there being inadequate numbers of such tellers and many of them being employed on a part-time basis, their estimates were subject to inaccuracies and they were likely to miss a lot of the fish landed. The available statistics, however, did point to certain conclusions. The fish appeared to be more abundant off the coast of the East Aden Protectorate where three times as much fish was landed as off the coast of the Federal States: and nearly all the sardines, anchovies and herrings (which together accounted for 40 per cent of all fish landed) were caught in the waters off the East Aden Protectorate coast. Tuna accounted for only a small proportion of the total fish landed—under 10 per cent. With regard to the possibilities of export markets there was a shortage of the better quality white fish—cod, haddock and hake—which are generally more acceptable in European markets. No trawl or drift net fishing was carried out so that only pelagic fish were caught; the potential for sea-bottom fish was unknown. The total of pelagic fish caught annually along the coast of South Arabia (excluding Muscat and Oman) was of the order of 100,000 tons.

The survey work that had been carried out in the area by the FAO[*] indicated that the most common fish was the small tuna whilst more generally scombroid fish were potentially the most important. The fish seemed to be more abundant off the northern Somali coast than off South Arabia. The prospects for longer-term more intensive fishing seemed reasonably optimistic as survey work carried out by both the Russians[†] and the British[‡] showed that there were fairly rich resources of plankton in the area. One possible barrier to large numbers and varieties of fish was the existence of an extensive oxygen-deficient layer occurring between depths of 150 and 1,000 m (495 and 3,300 ft) in the Arabian Sea and a somewhat less thick layer in the Gulf of Aden[§].

Four varieties of fish were found in the area. Sardine seemed to be the most abundant based on the regular heavy landings and the potential catch was of the order of 70 to 80,000 tons per year. Tuna stocks, mainly of the small variety, were of the order of 15 to 20,000 tons per year, whilst the potential for the remaining varieties—kingfish and Indian mackerel—was about 20,000 and 30,000 tons per year, respectively.

The conclusion on the potential of fish resources was that overall in the Gulf of Aden annual stocks of the four main varieties—sardine, herring, kingfish and Indian mackerel—were about 150,000 tons.

Utilization of a fisheries harbour

The problem immediately following from this was, given that the full potential of fish was caught every year, how much would be handled at Aden. Sardine fishing was unlikely to be of much interest. Over 90 per cent of the recorded catches were landed in the East Aden Protectorate (E.A.P.) and this would continue even if Aden had its own harbour. Moreover with the huge sardine fishery to the east of Mukalla in Qua'iti State it would be uneconomic to establish a sardine reduction plant as far away as Aden. So of the 70 to 80,000 tons of sardine potential only a very small quantity was of direct interest to Aden. The prospects for landing the other three varieties of fish depended mainly on the export market potential. The disposal of 50,000 tons of kingfish and Indian mackerel would have to rely almost entirely on this outlet. In the markets of Europe and North America, however, there was little demand for these fish, while those markets that did exist in Africa, the Middle East and South-East Asia were striving to develop their own fishing industries. There appeared to be markets for all the tuna that could be caught, with companies from Italy and the USA interested if the fish were available at an economical price. Much of this fish caught, however, by international companies would not find its way to a harbour at Aden, but would be delivered direct to the markets.

[*] Report to the Government of Italy by H. W. Ogilvie, D. L. Byrd and A. Fraser-Brunner of the FAO. *FAO Fisheries Paper No. 288.*

[†] In 1960 and 1961 the Russian research vessel *Vityaz* was used by the Institute of Oceanology of the USSR Academy of Sciences to study plankton in the Arabian Sea, Gulf of Aden, Bay of Bengal and Gulf of Andaman.

[‡] The work of the Royal Research Ship *Discovery* in the summer of 1963 in the Arabian Sea as part of the International Indian Ocean Expedition.

[§] The findings in the Gulf of Aden arose during the first Azcherniro expedition in the *Vladimir Vorobyov* during the north-east monsoon of 1961–2.

The whole question of the distribution of fish landed is important when considering a harbour project. An export-oriented harbour will require different facilities from one concerned mainly with supplying the internal market. For internal distribution the need is for good, cheap transport. In a road development study carried out by the EIU in Newfoundland it was found that the fishing industry, consisting mainly of salmon and halibut, was not being exploited to the full, due to bad roads and the high cost of internal distribution. The fish could not be delivered fresh and cheaply enough. This was not, however, the main problem in Aden, for the harbour was to be export-oriented. The internal market would consume only about 20 per cent of the fish landed there. So for Aden, and other export-oriented fishing harbours, it is more important to consider the facilities the harbour will have to offer particularly with regard to the storing and processing of fish awaiting export.

Potential of export markets

The economic viability of any harbour at Aden rested on maintaining export markets for 80 per cent of the total catch. There were two ways that an international company might use Aden:

(a) Establishing a processing plant, cold storage, canning and fishmeal production, and using the harbour as a trans-shipment base in conjunction with supplying the local market
(b) As a source of supply where vessels simply collected fish caught and landed by others—as Italy does from Port Etienne.

The main problem facing the international fishing companies was the lack of substantial information on the fish resources of the area; few companies were willing to fish in the area, until more was known about its potential. The available information pointed to the existence of only pelagic fish which were entirely unsuited to certain markets, e.g. Great Britain and Greece. Other nations approached already had investments in overseas countries, e.g. USSR in the Yemen and Somalia, and in overseas trans-shipment ports and canning industries, e.g. the Japanese at Penang in Malaysia, Port Louis on Mauritius, at Durban and Mombasa. In fact the potential of Aden as an export centre rested on its being used as a supply source by certain nations, e.g. Italy, the U.S.A., and possibly the Japanese, particularly for frozen tuna, if the price was right. This meant in fact a complete re-orientation of fishing methods by the local fishermen for in the past they had tended to regulate catches to maintain prices. There was also some interest shown in the USA in a tuna cannery should the fish prove to be abundant.

Competition from the ports

The conclusion was that there was a potential export market for fish from the Gulf of Aden but there was likely to be strong competition from other ports. Aden had five main advantages as a fishing harbour:

(a) a good harbour with excellent supplies of bunkering fuel and water
(b) a good supply of labour
(c) free port facilities for most goods
(d) situated on the major east-west shipping routes
(e) much improved facilities for ship maintenance and repair.

It also had two important disadvantages:

(a) lack of deep water at the spot proposed for a fishing harbour
(b) high labour costs compared with other sites in the area.

There had been two long-established Somali canneries and there were plans to develop further canneries with both government and foreign investment. French Somaliland was considering the development of tuna fishing with government assistance. Massawa in Ethiopia was also developing its offshore fishing and building an associated cannery financed from Bulgaria. Finally the fishing resources of the Red Sea and Persian Gulf were likely to be exploited by various nations over the next few years.

Conclusion on fish to be "landed" at Aden

The overall conclusion was that even if fish resources proved to be as high as 150,000 tons per year in the Gulf of Aden and adjacent waters, fishing would be extremely competitive as the other ports in the area sought fish landings. Export markets, upon which the success of a harbour project rested, were very uncertain. There was also the problem of territorial waters' fishing rights. If, as seemed the case, many fish prefer the shallower waters near the coast at certain times of the year, then the more abundant grounds off the Somali coast, the East Aden Protectorate, Muscat and Oman, would have been beyond the reach of Aden fleets. It was estimated that even in the very best years there would probably be no more than 40 to 45,000 tons of fish landed at a harbour in Aden. Of this about 10,000 tons would be consumed locally, the rest being exported.

The infrastructure of the harbour

Having established the quantity to be handled it is necessary to consider the whole infrastructure of the harbour—number of berths required, size of storage facilities, mechanical aids required, processing plants, and transport system for distribution. In Aden the majority of the fish—about 80 per cent—was to be landed by local fishermen in two types of vessel. The longliners and purse seiners could fish throughout the Gulf. About 27 m (90 ft) long, they would arrive at the rate of about ten a day during peak periods but only one or two a day in the off season of July to September. These would account for landings of about 20,000 tons a year. The balance of the local fishing would be accounted for by smaller motor boats, which would increasingly replace the traditional "sambuq" craft. These boats—about 15 m (50 ft) long—would land about 10,000 tons a year; in peak periods they would be arriving at the rate of about 25 to 30 a day, but at only three to four a day in the off season. In addition, facilities must allow for the use of Aden as a supply source and in consequence able to receive the large fishing vessels of up to 2,000 grt and drawing 6.7 m (22 ft) of water, used by many overseas companies.

The problem of establishing the number of berths required and the associated harbour facilities is not so complex for a fishing harbour as it would be for a general cargo harbour where the sizes and types of vessel to be handled are likely to be far more numerous; there is the problem of the types of cargoes that have to be handled—liquid, solid, inflammable, toxic; dockside facilities will vary with the types of cargoes handled; the optimum number of berths, which will be affected by the maximum allowable level of congestion at peak periods and the diseconomies of under-utilization of berthing facilities during off peak periods, will be far more difficult to establish. These factors, among others, make the appraisal of general cargo harbours far more complex than fishing harbours. The growing use of "containers" has also brought its own problems to harbour and port schemes.

ECONOMIC APPRAISAL OF THE HARBOUR PROJECT

On the harbour authority angle the important consideration is the level of dues to be charged. These would have to cover not only the costs incurred in operation and maintenance but also any financial responsibility inherited from the cost of construction. In addition, a potential fisheries harbour would have to consider the competition from other ports and levy dues at competitive rates. This was one of the problems in Aden as a competitive level of dues based on a flat rate for fish landed and a percentage levied on the value of the fish auctioned locally was insufficient to cover the capital repayments and interest charges on the loan of £1½ million ($3.6 million) needed. Additionally there was the problem of maintenance costs. So from the harbour authorities' point of view the project was not good financially. The appraisal would have to be viewed as to whether it might be in the Government's interest to subsidize the harbour for community benefit.

A very large commercial organization with fishing and fish processing interests might be interested in the possibility of establishing a fisheries harbour, using its own finance. It might utilize the harbour and facilities purely for its own purposes, or permit other organizations to use it against appropriate payment.

In either case the company would adopt the same overall policy, viz. to achieve its required rate of return on capital invested. Investment would cover a range of items, including as well as the harbour infrastructure, vessels and dockside facilities of various kinds. Even to contemplate such large investment of capital, no company could regard it as a short-term venture, or expect to recover its total investment in cash returns within a few years. It would evaluate the long term profitability of the whole operation by using discounted cash flow techniques. This method allows the company to take into account not only its own desired rate of return but also the uncertainties involved in the undertaking. To do this the company must consider the development of the total operation over a given period of years, calculating on the one side total costs including harbour construction, installations, maintenance and running costs of dockside facilities, vessels, etc; and on the other side the revenues accruing not only from the sale of fish and products but also from any harbour dues, rentals or other payments received from other users of the harbour and its facilities. In these calculations the company should take into account any net benefit in terms of cost advantage of operating in the area as compared with possible alternative areas.

For each year of the given period the company will have a net revenue (or deficit), and at the end of the period the total investment will be worth its residual value after allowance for depreciation. Each annual net revenue and the residual value are discounted by the company to present values at the rate of interest which will equate the total of the present values and the total cost of the investment. This rate of interest thus represents the expected rate of return on the project, and the company can decide whether this rate of return is sufficient to warrant its proceeding with the project. A slight variation of the method would be for the company to decide what rate of return it required from the project, and discount the annual cash flows and residual value back to present values at that rate of interest. If the sum of these present values then exceeded the total cost of the project, it would be worth proceeding with the project.

Community benefit

Cost-benefit analysis allows the valuation of all the costs incurred by, and all the benefits resulting from, the investment, for the economy as a whole—both direct and indirect. Whereas the harbour authority and commercial enterprise are concerned almost solely with the direct effects of their action on costs, revenue, profitability (the micro-economics of the situation), from the economy's point of view it is often the overall national (macro-economic) factors which are of greater importance. When all the factors are considered together it is possible to calculate the net effect of the project on the national income of the country.

On the cost side of the equation is, first of all, the original cost of the project, which in the case of Aden was about £1½ million ($3.6 million). Also, there are the costs of running and maintaining the harbour and allowances for depreciation on the vessels of local fishermen.

On the benefit side the first factor to consider is the value to the economy of the induced level of domestic and export sales of the product concerned brought about by the harbour, as well as any savings on import expenditure it may bring about. In the case of the Aden study the effect of the harbour in internal sales was negligible, and there was no question of any import saving factors. It was, however, the expected level of exports which would have been the main benefit of the project to the economy, for about 80 per cent of the fish landed at Aden was to be exported. Of this figure of about 35,000 tons, 12,000 tons was assumed to be caught by an international company and simply landed at Aden for storage to await transshipment, and the induced level of exports was about 23,000 tons, the value of which would be an addition to national income.

Other benefits were the inducement given by a harbour project to local employment and industry. The facilities of the harbour at Aden would have provided additional local employment, e.g. a fish market for about sixty people, an ice plant for thirty, and if a cannery were established, possible employment for up to two hundred. This addition to local employment was of benefit to the economy particularly where it involved the employment of otherwise unemployable people. The effect on local industry would have been a stimulus to such trades as boat construction, repair and maintenance services; suppliers of fishing equipment and power suppliers. The value of this induced level of activity must be calculated net of any import content of output, e.g. at Aden the substitution by local fishermen of small motorized vessels for their traditional "sambuqs". The local production of these craft would have entailed the import of wood and engines; the important factor is the value added element of local production. In fact all the benefits resulting from any harbour appraisal must be valued net of any import content, for whilst exports are national income creating, imports are a deficit on national income. Thus factors such as imported oil for sale as "bunkers" must be allowed for in the calculation of benefits.

All costs and benefits must be considered net of taxes and duties levied by the government as this represents merely a redistribution of income by the government and not an addition to it; so the dues levied by a harbour authority in Aden were not, for the most part, an economic benefit to the community, since the majority of users of the harbour would have been local inhabitants. Only those dues levied on international users of the harbour were of direct economic benefit to the community.

Having computed the value of the economic costs and benefits of the project spread over a number of years, these annual costs and benefits can then be discounted back to a present value, in a similar way to that employed by the commercial enterprise in its DCF calculations. Discounting the net benefits by a factor which makes the sum of the discounted benefits over a period of years plus the discounted residual value of the project equal the capital cost will give the rate of return on the project to the economy. The government can then decide the feasibility of the project. Alternatively the sum of the net benefits and the residual value of the project discounted at the minimum required rate of return will give a present value to all future benefits; the ratio of this to the cost of construction will give a cost-benefit ratio which if greater than one makes the project worth considering.

It will be clear that the application of sophisticated cost-benefit analysis requires, for the achievement of a meaningful and valid conclusion, a firm basis of factual data about fundamental resources. This firm basis was lacking in so far as fish resources in the Gulf of Aden and adjacent waters were concerned. Moreover, virtually no interest existed amongst international fishing companies in establishing an operation at Aden even if a harbour were to be constructed. The use of cost-benefit analysis would, therefore, have been inappropriate in these circumstances. To have used this technique to calculate the overall benefit to the community, basing calculations on estimates of fish resources which might well have been over-optimistic, as well as on the unlikely assumption of future capital investment by fishing companies in Aden, would have run the risk of producing a widely misleading conclusion.

The Aden proposal was, therefore, calculated from the viewpoint of the future harbour authority, since available information was adequate to calculate broad estimates of revenue to compare with broad costs. The conclusion was that likely revenue accruing to the harbour authority would be insufficient to justify the possible cost involved.

ON METHODS OF APPRAISAL

The decision as to which method of appraisal should be used for any harbour scheme lies with the client. Provided that sufficient and adequate data are available, the cost-benefit analysis would be regarded as the appropriate approach if the client's overriding interest is the community as a whole. It is possible that the evaluation by this method might arrive at a positive answer even if an analysis strictly on behalf of a harbour authority or on behalf of a commercial company considering building the harbour as a base for its own fishing and fish processing operations were to prove negative. Thus, the additional income generated through the establishment of a fisheries harbour and attraction of external fishing interests, plus the possible saving to public funds from the resultant reduction in unemployment payments could offset the shortfall in costs of the harbour and the revenue accruing to the operating authority. If the benefits to the community exceeded costs by a sufficient margin government subsidies to the harbour authority to keep dues down, or to local industries to keep down costs of services to the harbour might even be justified.

Fish Landing and Marketing Facilities in Thailand

by D. Menasveta

Installations pour le débarquement et la commercialisation du poisson en Thaïlande

Le document national reçu de la Thaïlande présentant un intérêt général, il a été reproduit en entier. L'auteur décrit tout d'abord l'expansion remarquable, au cours de ces dernières années, des pêches thaïlandaises qui, en 1967, avaient débarqué une quantité de poisson quatre fois plus grande qu'en 1958. Cette évolution est due notamment à l'entrée en service d'une flotte chalutière et à l'utilisation de bateaux de pêche plus grands. Le gouvernement avait créé en 1953 une Organisation pour la commercialisation du poisson chargée de promouvoir et d'organiser l'expansion de l'industrie halieutique. Elle était également responsable de la construction de ports de débarquement dans plusieurs localités le long de la côte du Golfe de Thaïlande ainsi que sur la côte occidentale. Il existe actuellement 26 quais et jetées de débarquement dans le pays. L'auteur décrit le rôle joué par le gouvernement dans le financement de ports de moyenne et de grande importance, et donne également des détails sur les améliorations dont ont fait l'objet les ports de moindre importance, qui ont bénéficié de fonds provenant des associations de pêcheurs ou des autorités locales. L'auteur souligne l'insuffisance du réseau portuaire actuel et fait état des plans établis pour son développement futur. Quant aux principaux marchés de poisson, ils sont eux aussi inadéquats étant donné le volume actuel des débarquements. Aussi des études ont-elles été entreprises en vue de leur expansion. L'auteur mentionne les difficultés et les erreurs du passé. Il décrit la structure et le fonctionnement de l'Organisation pour la commercialisation du poisson, ainsi que les exigences qu'elle a fait valoir en matière de développement portuaire et de commercialisation du poisson. L'auteur fait des commentaires et décrit les principaux aspects de l'organisation commerciale et des systèmes de vente.

Medios para el desembarco y la comercialización de pescado en Tailandia

De los documentos enviados por los países, el de Tailandia se ha reproducido interamente, por considerarse de interés general. El autor describe primeramente la expansión tan considerable registrada estos últimos años en Tailandia: en 1967, la cantidad de pescado desembarcado fue más del cuádruple de la de 1958. Ello se debe, en parte, a la introducción de la pesca al arrastre y al empleo de barcos más grandes. El Gobierno creó, en 1953, la Organización de Comercialización Pesquera, con el objeto de organizar la expansión de la pesca; parte de las funciones de esa organización es la construcción de puertos para el desembarque del pescado en varias zonas de la costa del golfo de Tailandia y de la costa occidental. El número actual de muelles y malecones para el desembarco es, en todo el país, de 26. Describe después el autor la función del Gobierno en la financiación de los puertos de tamaño medio y grande, y da detalles sobre las disposiciones relativas a los puertos más pequeños, para los cuales se emplean también fondos de las asociaciones de pescadores o de las autoridades provinciales. Señala que la actual red de puertos no es suficiente y expone los planes para su ulterior desarrollo; también son insuficientes los principales mercados pesqueros con respecto al actual volumen de los desembarcos, y se está estudiando su expansión. El autor alude a las dificultades y errores cometidos en el pasado; describe la Organización de Comercialización Pesquera y sus funciones en relación con el desarrollo de los puertos y de la comercialización pesquera. Se indican algunos de los impuestos en vigor y se describen los principales aspectos de los sistemas de venta y de la organización del mercadeo.

FISH is one of the most essential items in the diet of the Thai people as well as the rest of South-East Asia. With expansion of population in Thailand at about 3.1 per cent per annum, demand for an increased fish supply is natural. The Thai Government has therefore incorporated fisheries development into its overall national economic development programme. In its second phase (1967 to 1971), the target set is to increase the harvest of both marine and freshwater resources of the country to 1,000,000 metric tons by 1971.

To achieve this, the Government has approved various projects including:

(a) Exploratory fishing
(b) Education and training of fishermen for high sea fisheries
(c) Establishment of capital for investment in the highsea fisheries as well as in fish culture
(d) Conservation of living resources of the sea of economic value
(e) Development of freshwater fisheries including the improvement of methodology and techniques in fish culture and the development of reservoir fisheries
(f) Development of fishing port facilities to accommodate the increased supply of fish and other aquatic products.

The Fish Marketing Organization, an autonomous body under the Ministry of Agriculture, in close collaboration with the Department of Fisheries has carried out the development of fishing port facilities to accommodate the increased landings and marketing of various fisheries products in Thailand.

Size and nature of the industry

In earlier days, the fisheries were confined almost entirely to inland waters and the inshore waters of the Gulf of Thailand. The fishing boats employed were virtually non-mechanized, and the majority of gear used was traditional, such as bamboo stake traps, set bag nets, etc. During the last three or four decades more conventional types of fishing gear including Chinese purse seines, locally called "Oun Tang Ke", and modified Chinese purse seines or

TABLE 1. ESTIMATED ANNUAL CATCHES OF THAILAND, 1958 TO 1967
Metric tons*

Group of species	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
Marine										
Mackerels	44.300	36.130	29.946	23.235	36.065	23.313	52.524	69.878	87.803	130.878
Sharks and rays	2.700	2.810	4.325	3.977	4.465	5.147	5.773	7.445	6.795	8.049
Other demersal fishes	37.100	42.100	44.861	102.608	126.763	189.998	327.154	338.944	384.429	442.202
Shrimps and crabs	10.300	13.520	14.525	16.492	20.175	32.505	38.715	46.277	57.330	75.092
Molluscs	50.600	53.210	52.814	86.960	82.241	72.411	40.030	66.939	98.808	105.674
Seaweeds	—	—	—	—	—	—	—	—	—	293
Total marine catch	145.000	147.770	146.471	233.275	269.709	323.374	494.196	529.483	635.165	762.188
Freshwater										
Air breathers	17.400	20.590	35.034	22.694	25.224	48.969	26.512	35.708	38.744	39.862
Carps	5.500	7.290	7.458	8.969	9.593	7.962	7.693	9.689	9.901	8.918
Miscellaneous	25.100	26.040	25.667	37.364	31.768	35.006	44.751	36.280	33.164	32.990
Prawns	3.300	3.100	4.415	3.303	3.494	3.374	3.834	3.960	3.308	3.701
Total freshwater catch	51.300	57.020	72.574	72.330	70.079	95.311	82.790	85.637	85.117	85.470
Total catch	196.300	204.790	219.045	305.605	339.788	418.685	576.986	615.120	720.282	847.685

* Source: Statistical Section, Department of Fisheries, Bangkok, Thailand.

"Oun Cha Lom", have been used to catch schooling surface fishes such as mackerel, sardine-like fishes, etc. More boats have become mechanized.

It is only within the last decade that marine fisheries have expanded rapidly. The major reason for this is the introduction of trawl net fishing. Fishing, from mechanized trawlers and bigger purse seiners has been extended to grounds far from shore. Meanwhile, more fishing grounds have been located in the Gulf of Thailand and in the Andaman Sea. The gill net fishery has also contributed to the expansion of marine fisheries.

In 1967 the total landing of marine and freshwater fish of the country was estimated at 847,658 metric tons, a four-fold increase over 1958 (Table 1). Marine landing amounted to approximately 89 per cent of total landings in 1967.

A census by the Department of Fisheries, and the National Statistical Office, in 23 provinces along the coasts of Thailand in May 1967, indicated that there were 53,456 marine fisheries households consisting of 332,069 persons engaged in various activities relating to marine fisheries. The number of inland fisheries households is not known at present, but it is known that farmers are also part-time fishermen. In the marine census, the households were divided into three major categories, namely: enterprise fisheries, subsistence fisheries, and employees engaged in various activities. The census showed that subsistence households amounted to 38,321 or 71.7 per

TABLE 2. THE NUMBER AND SIZES OF FISHING PORTS UNDER THE DIRECT MANAGEMENT OF THE FISH MARKETING ORGANIZATION, AND THEIR RESPECTIVE LANDINGS FROM 1965 TO 1967*

No.	*Name of fishing port*	*Type*	*Commencement of operation*	*Size (metres)*		*Cost of land and construction (Baht)*	*Landings (metric tons)*			*Remarks*
				Width	*Length*		1965	1966	1967	
1.	Bangkok Fish Market	Quay	1953		246 (820 ft)	7.763.005 ($ US 388.150)	63.415	82.020	91.424	Situated in 7.28 acres of land
2.	Ranong Fishing Port	Quay	1965	10.6 (35 ft)	98 (330 ft)	4.877.000 ($ US 243.850)	1.474	1.017	995	The compound covering 40 acres of land
3.	Hua Hin Fishing Port	Jetty	1965	3 (10 ft)	192 (640 ft)	943.000 ($ US 47.150)	348	4.631	3.909	Quay at the end of jetty, 8 × 29 metres
4.	Song Khla Fishing Port	Quay	1966	20 (67 ft)	92 (367 ft)	3.877.000 ($ US 193.850)	—	4.565	3.750	
5.	Samud Sakorn Fish Market	Quay	1967	16 (53 ft)	150 (500 ft)	4.920.000 ($ US 246.000)	—	—	2.988	Landing for the last 6 months
6.	Pran Buri Fishing Port	Jetty	1967	3 (10 ft)	144 (480 ft)	728.000 ($ US 36.400)	—	—	1.309	Quay at the end of jetty 7 × 25.50 metres
7.	Trad Fishing Port	Quay	1968	12 (40 ft)	104 (347 ft)	6.793.667 ($ US 339.700)	—	—	—	Covering 100 acres of land

* Source: Unpublished report of the Fish Marketing Organization.

cent, employed households amounted to 12,364 or 23.1 per cent, and enterprise households were only 5.2 per cent or 2,771.

During recent years, fishermen have used more mechanized boats. The number of households using mechanized boats at the time of the census was 30.2 per cent, those using non-mechanized boats, 29.4 per cent, and those not using any boats 12.1 per cent. Labourer households consisted of 23.1 per cent of the total work force.

Fishing ports and their respective landings

To create facilities for landings and the flow of products to consumers, the Government established the Fish Marketing Organization (FMO) in 1953. Since then landing ports of various sizes have been constructed along the coast of the Gulf of Thailand and on the western sea board. At present, there are 26 fish landing quays and jetties. Among these, 11 are of medium and large size and were constructed using Government budget appropriations. The other 15 were constructed using the fisheries promotion fund, built from money collected as service charges in the Bangkok Fish Market and supporting funds from fishermen's associations or provincial authorities.

The Fish Marketing Organization has direct control over five fish landing piers and two wholesale fish markets. The number and sizes of these fishing ports and the markets and their respective landings from 1965 to 1967 appear in Table 2. Fig 1 shows the locations of the wholesale fish markets and other fishing ports under direct control of the FMO.

Present inadequacy of the port network

Due to the increased demand for more landing jetties or small quays along the coasts of the Gulf of Thailand and the Indian Ocean, it is felt the present network of ports is not adequate. There is certainly room for improvement of the Bangkok Fish Market, and more jetties or landing piers should be built in certain provinces especially those in the southern part of Thailand.

The Government, has already planned to improve and expand the network of fishing ports. A landing pier of medium size is being constructed at BanDon District, Surat Dhani Province (South Thailand), one of the busiest fishing ports. Other ports are planned in Pattani Province in the South (fig 1), and in Samut Songkram Province.

The Fish Marketing Organization also has a long range plan to expand the network of fishing ports in several major fishing provinces along the Indian Ocean coast namely: Pukhet, Kan Tang and Satul.

Increased supplies have forced the Fish Marketing Organization to consider moving the Bangkok Fish Market to a new and more suitable site. A special fund has been allocated for a feasibility survey.

In general, the landing ports established in various provinces have facilitated the flow of fisheries products to various markets. Nevertheless, some of the ports established have not yet yielded favourable results. At Ban Lam District in Petchburi Province, the proposed paved road connecting the port with an arterial highway leading to Bangkok has not yet been constructed by the provincial authority. Due to lack of funds on the part of the Fish Marketing Organization, the jetty built at Prachuab Province is too short, which results in difficulty in unloading the catches, as, at this port: fishermen can unload only at high tide.

Development of fishing harbours

The Government of Thailand plans multi-purpose harbour development. The primary aim is harbours for cargo boats and strategic purposes in certain locations along the coasts of the Gulf of Thailand and of the Indian Ocean side.

Although the Fish Marketing Organization is keenly interested in developing fishing harbours in certain provinces activities at present are confined to the creation of small and medium sized quays or jetties at major fishing villages along the coast. This is due to lack of funds.

During the past decade, there has been a very satisfactory improvement in the transportation and communication facilities. Many paved roads and highways have been built by provincial authorities and by the Government.

Transport of fisheries products by railway is still important but transport by truck is taking over.

Government role in fishing port development

The fisheries development programme is an integral part of the overall economic development plan. To carry out the programme the Fish Marketing Organization was established by the Government in 1953 as an autonomous body within the Ministry of Agriculture. By law, the organization is a juridical body, the duties of which include the operation of wholesale fish markets, the control of the fish marketing system, and the promotion of fishermen's welfare. It is authorized by the Government to "construct, purchase, procure, dispose, hire, let on hire, own or possess various properties, to borrow money or goods, and to loan out money or goods". It is also responsible for the establishment of a wholesale fish market in any locality deemed appropriate.

At present, there are two wholesale fish markets namely: The Bangkok Fish Market and the Samut Sakorn Fish Market—recently established and now in operation.

The operations of the Fish Marketing Organization are directed by a committee consisting of a Chairman and not more than six others. This committee, appointed by the Council of Ministers, holds office for a term of two years, but may be reappointed.

At wholesale fish markets such as that at Bangkok, fish agents act as sellers. The fish agents are licensed by the Department of Fisheries and are under the control of the Fish Marketing Organization. In the Bangkok market there are 12 agents.

The planning and implementation of fish landing piers are also the responsibility of the Fish Marketing Organization. The ordinary procedure is as follows:

(a) The FMO will consider the need or request from a group of fishermen to set up a fish landing pier in a certain area

(b) The FMO Committee will decide whether such a pier would eventually benefit those fishermen

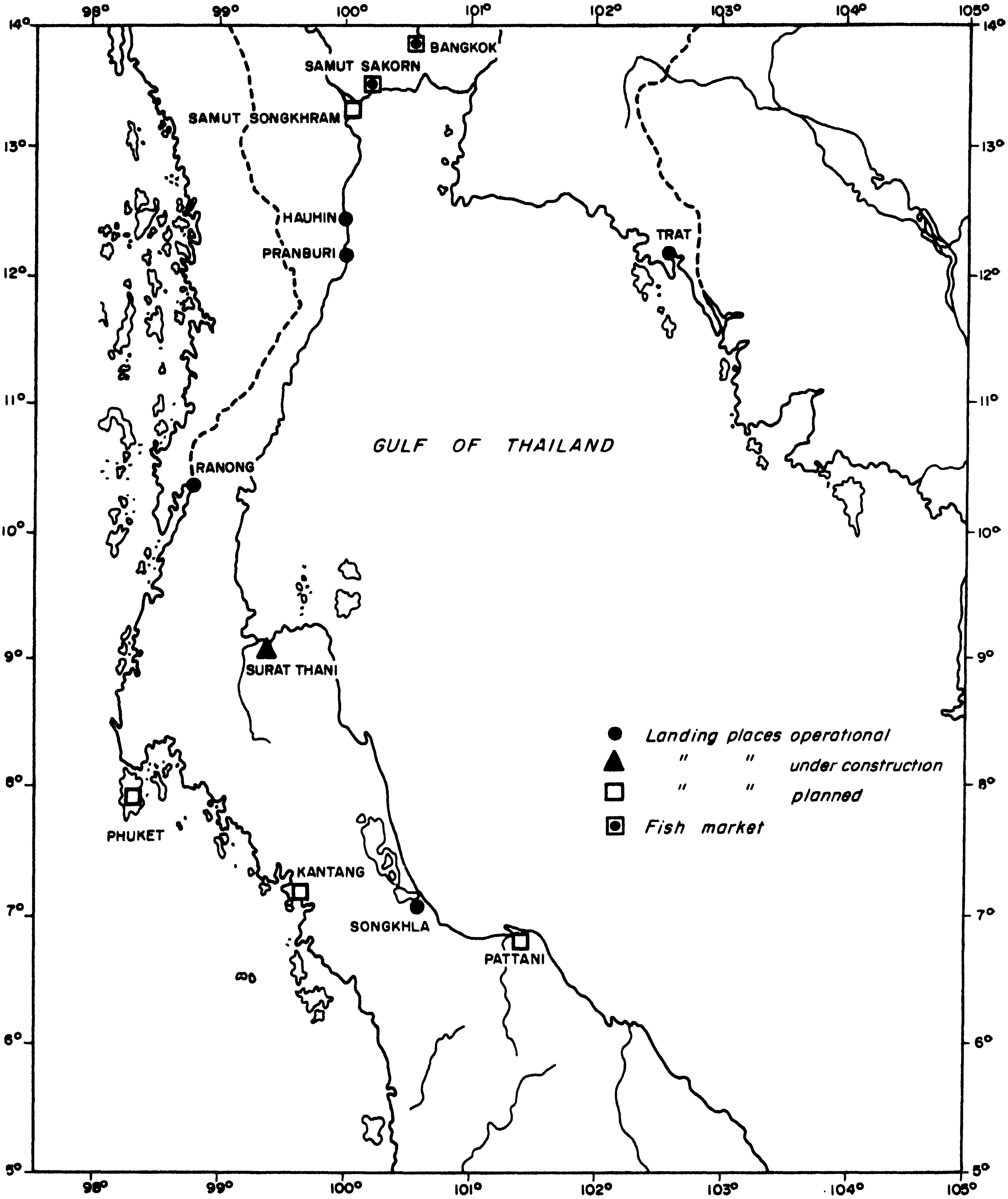

Fig 1. Locations of the fish markets and landing places which are under the direct control of the Fish Marketing Organization.

(c) If the programme is approved, the Committee will then consider what channel of funding should be sought; i.e. from the fisheries promotion fund, the Government budget, or local contributions
(d) The FMO will also make a feasibility survey for a suitable site of the landing pier, etc.
(e) If such venture requires large investment, the programme may be submitted to the National Economic Development Board for consideration and approval in procuring a government budget appropriation
(f) If the project is approved, the FMO will be responsible for drafting the overall plan of the proposed construction
(g) The FMO will be responsible for bidding and supervision of the construction.

Local administrative agencies

The fish landing facilities in Thailand may be divided into three categories as follows:

(a) Wholesale fish markets
(b) Government owned and operated landing ports
(c) Government subsidy ports.

Government landing ports are medium sized ports built by the Fish Marketing Organization, using the Government budget appropriation plus the money derived from the operation of the two wholesale fish markets. In this category, the Government provides the land and quays or jetties. The selling of fish is through private negotiation between fish owners and buyers. Only a minimal charge is made by the Fish Marketing Organization, which is responsible for the care and maintenance of the property. These charges are used for the repair and maintenance of such ports. In this case, the Organization will appoint a staff consisting of a port manager and service staff for each port. This administrative body is directly under the supervision of the Director of the Fish Marketing Organization. At present, there are five fishing ports of this kind (fig 1).

Government subsidy ports are of small size. They are built using the Fisheries Promotion Fund of the FMO plus contributions from local fishing communities, fishermen's associations, or provincial authorities. The operation and maintenance of such a port is undertaken by a local fishermen's association or a local provincial authority. At present, there are 19 small quays and jetties of this category along the coast of the Gulf of Thailand.

Charge and rate structure of wholesale fish markets

At the wholesale fish markets in Bangkok and Samut Sakorn, fish agents must be licensed by the Director-General of the Department of Fisheries. The charges for fish agent licences are given in Table 3.

For selling fish by auction, a fish agent receives a commission of five per cent of gross sale. The Fish Marketing Organization collects one per cent service charge from gross sale. Other charges include landing fees from fish owners and entering charges from fish transport vehicles carrying fish to markets. The minimal landing charge for the fish owners, which varies from port to port, is limited to those ports directly under the Organization and management other than the Bangkok and the Samut Sakorn Fish Markets.

TABLE 3. CHARGES FOR LICENSING OF FISH AGENTS*

	Particulars	*Annual fee*	
		Baht	*$US*
1.	Licence for undertaking the activities of a fish agent of the category of fresh fishery merchandise (saltwater and freshwater fish)	5.000	250
2.	Licence for undertaking the actities of a fish agent of the category of salted or dried fishery merchandise (saltwater and freshwater fish)	3.000	150
3.	Licence for undertaking the activites of a fish agent of the category of fresh fishery merchandise (for fresh water fish only)	500	25
4.	Licence for undertaking the activities of a fish agent of the category of salted or dried fishery merchandise (for freshwater fish only)	300	15
5.	Licence for auctioneer	200	10
6.	Duplicate copies of licence	20	1

* Source: "The Act Organizing the Activities of the Fish Market, B/E/2496", Fish Marketing Organization, Ministry of Agriculture.

FISHERIES WELFARE AND PROMOTION FUNDS

From the one per cent service charge, a quarter is set aside for the fishermen's welfare fund or fisheries promotion fund. The balance of the money collected is utilized for maintenance services, for the operation of the organization, and for future expansion of the network of fishing ports of the country.

The fishermen's welfare fund or the fisheries promotion fund have been utilized in many welfare projects (Table 4).

The principles for giving aid to a fishing community are:

(a) The aid must be within the objectives or functions of the Fish Marketing Organization and should meet community need. All aid must be approved by the Committee of the Organization
(b) The aid must contribute to the public benefit or to the majority of the fishermen in the village
(c) The fishing community must be prepared to contribute a counterpart fund for an aid project.

Policy of the Government

The general policy of the Thai Government on wholesale fish markets is that these markets serve as a pool before the fish is transferred to consumers. The majority of Thai people prefer fresh fish but products derived from elementary processing such as salting, drying, or steaming are also utilized. Advanced processing such as canning is on a limited scale. During recent years, however, several fish reduction plants have been established in the southern part of Thailand, utilizing trash fish from trawl fisheries.

Quality control arrangement

At present, there are no quality control arrangements. The Fish Marketing Organization, however, gives advice to fishermen on handling and preserving catches with ice.

TABLE 4. SUMMARY OF AID TO FISHING COMMUNITIES IN THAILAND BY THE FISH MARKETING ORGANIZATION
1954 to 1966*

No.	Particulars	No of projects	*Categories of fundings*		*Contribution from the community*	*Total*
			Fishermen's welfare fund Baht	*Government budget Baht*	*Baht*	*Baht*
1.	Construction and repair of fish landing piers	27	1.482.754.75 ($ US 74.150)	22.357.351.43 ($ US 1.117.850)	418.117.65 ($ US 20.900)	24.258.223.83 $(US 1.212.900)
2.	Construction and repair of wells, concrete water cisterns	43	805.957.03 ($ US 40.300)	- -	208.356.21 ($ US 10.400)	1.014.313.24 ($ US 50.700)
3.	Construction and repair of roads and bridges in fishing villages	23	878.993.20 ($ US 43.950)	—	603.890.46 ($ US 30.200)	1.482.883.66 ($ US 74.150)
4.	Construction of light houses and navigation signposts	11	305.843.45 ($ US 15.300)	—	59.552.50 ($ US 3.000)	365.395.95 ($ US 18.300)
5.	Construction of schools and purchase of educational equipment	20	358.197.16 ($ US 17.190)	—	369.753.00 ($ US 18.500)	727.950.16 ($US 35.690)
6.	Miscellaneous aid	14	409.329.00 ($ US 20.450)	—	302.665.00 ($ US 15.150)	711.994.00 ($ US 35.600)
	Total		4.241.074.59 ($ US 211.340)	22.357.351.43 ($ US 1.117.850)	1.962.334.82 ($ US 98.150)	28.560.760.84 ($ US 1.427.340)
	Per cent.		14.85	78.28	6.87	100

* Source: Unpublished record of the Fish Marketing Organization.

The Fish Technology Laboratory of the Department of Fisheries is carrying out a study on the use of ice to preserve the catches. The Applied Research Corporation, an affiliated body to the National Research Council, is also conducting research on the shelf life of various fisheries products (mainly dried and salted mackerel) using various preservatives and antibiotics.

Common market service

Transport of fisheries products to and from the wholesale fish markets by land is entirely by private concerns. The FMO only gives facilities for the smooth flow of traffic within the compound of the Bangkok and Samut Sakorn Fish Markets.

The FMO is responsible for the maintenance of hygiene within the fish markets which are thoroughly cleaned every day. It provides fresh water for drinking and for cleaning fish as well as electric lighting. At the Bangkok Fish Market, cold storage and an ice plant are available.

Standard fish containers made of split bamboo are sold to the "outer labourers" who are responsible for the transfer of fisheries products from the market to retailers in various fresh markets in Bangkok and adjacent provinces.

The FMO regularly issues landing statistics including the prices of major species of fish. The market news and the fluctuation of prices of major species are also regularly broadcast. In addition, the results of the exploratory fishing surveys of the Department of Fisheries and the weather forecast are published.

SUMMARY

Though there has been progress in the fishing port development projects during the past decade, there exist shortcomings; for instance, some of the projects have failed to yield satisfactory results. At Trad Province, though the fishing port is in operation, the fishing boats have to wait for high tide to bring their catches into the port. To solve this, dredging of the navigation channel from the mouth of the Trad River into the port is needed. In another case, lack of good paved roads connecting the port with the highway hinders fish landing.

Conflicts often arise between the managers of a new port and fish agents or authorities who derived benefits from fish sales prior to the existence of the new port.

Finally, in order to maintain the efficiency of the present network of ports at a satisfactory level, fish owners, fish agents, the provincial authorities and the FMO must work together. This will eventually contribute to the economic development of the country as a whole, as fish is an essential item of food for the Thai people.

DISCUSSION

IMPROVEMENTS TO EXISTING MINOR LANDING PLACES

O'Meallάin (Ireland—Chairman) said that it was difficult to exaggerate the importance of this session because, irrespective of major development, minor fishery ports continued to play an essential role in fishing activity, not only in those countries which were still at a relatively early stage of economic development but also in the developed countries.

It was perhaps worth while saying that the technical approach which is indispensable where large fishery harbour projects were concerned was at least equally appropriate in the case of minor works; the importance of such minor works in a particular context may be fully as significant as that of a much more ambitious project in a different one.

He drew attention to the penultimate paragraph of the paper by Dibbs saying that participants might feel, as he did, that the inshore fisherman, who might preferably be denominated the "owner" or the "self-employed" fisherman, had a considerable contribution to make to the economy, provided his role was recognized and that appropriate encouragement was given to him.

The development of large fishing harbour complexes did not, of itself, necessarily mean the obliteration of small ports even in their near vicinity, but that the minor ones could draw fresh life from the activity of their larger neighbours and even contribute towards their big neighbours' prosperity.

Concentration in Sweden

Lindskog (Sweden) said that his country had a very old-established fishery industry and a total of about 600 fishing ports and fishing harbours. Since 1880 when the great emigration, especially to the United States, began, the Swedish Government had paid about 90 per cent of the cost of constructing fishing ports, 10 per cent being paid by the municipalities. It had been found that the number of fishing ports would have to be reduced in future. Initially the programme had been for retaining and modernizing about 50 to 60 out of those 600 (of which 380 had been built in the past 80 years). The programme was now for about 40 which meant that better ports could be provided, with more facilities for landings of fish especially from the North Sea and the Atlantic. Many people considered that this sort of development of centralized ports was wrong and that all those ports where fishermen were living and owned their houses should be retained. In a country such as Sweden, however, it was not necessary to live where one could see one's boat from the window—many workers in Sweden travelled as much as 10 km to their place of work. On the west coast, where many of the ports were, some were very old, many of them dating from the Viking period. The intention was not to turn those old ports into monuments: in a country with a high and ever-increasing standard of living they could be used for small pleasure boats and for the amenities of workers who are working less hours per week now than formerly. In the future there would probably be a general forty-hour week which would give much time for recreational activities and therefore many of the smaller fishing ports could be converted to "marinas" and be used in other ways.

Mexico's plan

Gutierrez Lopez (Mexico) asked for the opinion of the experts on the scheme by which Mexico intended to develop small fishing terminals to serve existing small vessels. The scheme would have three main elements:

1. A study of local conditions.
2. A plan for the development of marine and shore facilities and a training programme to improve fishing methods.
3. Provision of local services and amenities.

The initial investment would be made by the Government with only a small nominal contribution from each community concerned. Subsequently the administration and exploitation would be done by the community, under the supervision of experts in the different disciplines.

The time allocated to the pilot project was two years, during which information would be collected on existing centres, resources and the other socio-economic aspects. A group of experts would also be trained who could, in the future, advise the developing communities.

This development programme was independent of any other which might be undertaken to improve existing terminals or to build other larger terminals which could constitute concentration centres for the small communities to be developed.

Growth of UK small ports

Martin (UK), while not speaking on behalf of the whole of the UK but only of Scotland, said that the fishery industry there was a very old-established business and, although a great deal had been said about the uneconomic situation of small ports, this was not the case in Scotland. The small ports provided work for local communities and were very well assisted by the central Government. The special feature of most Scottish harbours was that they had been built many, many years ago, usually by a private landowner. They were built in stone and rarely taken below low-water mark. As the fishing fleet progressed from rowing boat, to sail and then to steam and diesel, the piers and harbours were extended by succeeding owners and authorities, sometimes over very ill-prepared foundations, with the result that harbour development was lagging somewhat behind the other fishing industrial developments. No policy of closing down harbours had been introduced but grant-aided schemes would not be given priority if a neighbouring developed port was capable of providing satisfactory facilities. A distinction was emerging between minor working ports and more or less "dormitory" ports where boats simply went and were garaged. However, the problem was that most harbours now required extension, either in breakwaters, quays or dredging and the supply of services.

As regards the classification system of fishery harbours, in Scotland this had been based on the quantity of fish landed, which seemed to be a very fair test of the importance of the facility.

Dual-purpose ports?

Fergusson (Barbados) stated that his Government was currently giving active consideration to the extension of the deep water harbour, which was a purely commercial one, and a Committee had been established to make recommendations for the planning and design of the additional facilities to be provided. Among the matters engaging the attention of the Committee was the establishment of a fishing port since there were none in Barbados, although there were approximately 22 landing beaches along the 55 miles of coastal waters.

The fishing fleet consisted of over 400 small diesel powered craft, 24–30 feet in length. These boats operated only within 25 miles of the shore due to lack of navigational knowledge or facilities. During the main fishing season, from November to June, sufficient fish was caught both for immediate local consumption and for storage for use during the off-season. There was also a shrimp fleet of 35 vessels of between 10 and 80 feet in length. Most of their catch was for the export trade.

Expansion of the industry could only be made by the introduction of offshore fishing. The United Nations Special Fund Fishing Project for the Caribbean, which had its headquarters in Barbados, had been conducting experiments in deep sea fishing for the benefit of the area.

Extension of the fishing industry would have to be accompanied by the provision of shore-based facilities such as a processing plant, cold storage, dry docking and transportation services, as well as landing and berthing. In a small country such as Barbados the fishing port would have to be as near as possible to normal shipping facilities where cold storage could be provided which the fishing port could use. However, care would be taken to ensure that separate shipping channels were used for the fishing fleet and that the fishing and commercial ports were not unduly disturbed.

Problem of open beaches

Russell (UK) thought that there was a possibility for immediate improvement of the productivity of those fishermen who had no harbour at all and used canoes on open beaches. The productivity of such fishermen must be very low indeed, because the size of the nets that they could draw was very small. What was needed was larger nets, which required more power and therefore larger engines and a bigger boat in order to install the engine, thus ending up with a boat too large to manhandle through the surf and too heavy to drag up the beach. Would it be possible to increase the size of this craft? With mechanization of the operation he thought it was.

Studies could now be made in a laboratory of the forces on a craft in breaking waves. Such forces were not really massive; they depended to a certain extent on the rigidity with which the craft was held but were certainly less than half the weight of the craft. Supposing one had a winch and rope system strong enough to drag the craft up the beach and the coefficient of friction between the sand and the boat were something like 1, a rope would therefore be needed which would pull the weight of the craft, i.e. a 10-ton craft would require a 10-ton rope. Russell's argument was therefore that with a 10-ton rope and a 10-ton winch it would be possible to bring the craft through the breakers with absolute safety under any conditions.

This was, in his opinion, about the only way in which fishing could be improved on beaches where there were no harbours at all. The building of small harbours for the smaller craft on coastlines where there was a littoral drift was naturally very difficult if not impossible for reasons of high capital and maintenance expenditure. There was no chance whatsoever of a small fishery being able to support the maintenance costs of clearing away say 1 million tons of littoral drift a year. He maintained that the method he had just described was probably the only way of providing improved facilities in the circumstances.

Marketing is the real aim

Campleman (FAO) said that he was very pleased to hear Russell's contribution because it brought the Conference rather closer to what was the main theme of the Session. The problem was essentially that, while it was agreed that the larger a fishing port was, in many respects the better it was, since there were economies of scale and many more services could be provided, for most developing countries this was not a practical solution. There were many reasons for this; it might be for instance that the transport network was inadequate. Therefore, many countries were in the position of having to effect improvements to beach landing places and to quite small harbours and ports on which to base the expansion of their fishing industry.

Although the Conference was about fishing ports, in the wider picture it was a very good question whether fisheries development was better served by better harbours or by better roads. In many cases better transport facilities would effect more of a potential for development than the provision of better harbours themselves.

On the question of beach landings, therefore, it would interest everyone to hear views about relatively simple or unsophisticated methods of getting vessels ashore as suggested by Russell. In a number of countries types of vessel specifically designed or adapted over a very long period for this purpose had been seen. Two instances were the Yorkshire coble which is beached, or used to be beached in the sailing days, stern first and in a highly efficient manner and, at Hastings on the south coast of England where there was a very steep shoreline, large vessels of up to 40 ft were beached by means of winches and skids. It was that type of solution: improved beaches, improved concrete ramps, improved methods of getting boats out of the water which might give developing nations assistance in solving their problems.

Lomell Delgado (Mexico) reported that Mexico was trying to develop its small fishing communities and any guidelines for increasing the productivity of such units would no doubt be useful to them. Mexico had almost 10,000 km of coastline and a large land mass, 2 million square kilometres. Distances were very great and difficulty often arose in the economical transportation of fish products since the service infrastructure, especially the transport sector, was still in a state of imbalance.

Combined study arranged

Gifford (UK) followed up on Russell's and Campleman's statements, albeit very tentatively, since he spoke as a Civil Engineer and only as a part-time sailor. He had also made a study, as a hobby, of the question of beach-landing of fishing craft over the years and it was quite clear that this had been a traditional development whereby the landing of a craft had been the biggest problem, and the keeping at sea afterwards had been a lesser problem. With the advent of deep-water vessels, the keeping at sea became the major problem and the landing, because of the development of better harbours, a lesser problem, so that technological investigation abandoned the development of beach-landing and engineers concentrated on the creation of ports. It was quite clear, as Russell had said, that the problem of a major littoral drift could not be solved by civil engineering works and a solution must be sought in the development of craft suitable for beach landings. What was needed was a new approach to the whole problem, namely, pairing the craft and the device ashore in one unit. The problem was not merely that of the forces on the craft, which Russell had shown were not very great, but of the control of the craft in the surf and at the point of contact with the beach. In the case of a big vessel with a large capital investment then a lot of money was lost if it capsized. He nevertheless supported very strongly the view that had been put forward.

In discussions with Russell, they had agreed to make an initial joint investigation on these topics and make known the results to the FAO Department of Fisheries.

Big problem in Philippines

Mane Andres (Philippines) noted that very little had been heard from the developing countries especially those in south-east Asia. Fishing was a very important industry in the Philippines with its numerous islands. It had a land area of about 300,000 km² and a coastline of about 18,000 km, with the entire country divided into 7,000 islands. Each coastal area was a potential landing place. There were about 5,000 marine fishing communities distributed around the islands and most of these were more or less unconnected by roads to the main highways linking them to the cities or urban areas where the fish could be marketed. There were many differing types of landing place but they had a common factor that most had practically no port facilities. There were about 250,000 small fishing craft, mostly moored in sheltered bays and coves, concentrated in the more sheltered places. On the open coast there were not many landing places. The fishing craft ranged from dugouts from 5 to 15 metres and there were not normally any gadgets, such as winches with shore lines, and craft had to be beached by the fishermen themselves unassisted. There were, however, bigger vessels, about 4,500 boats of more than 3 gross tons but unfortunately the Philippines did not have fishing ports and harbours as in Europe and elsewhere. However, they were now preparing plans for a fishing port and fish market in the Manila area where about 50 per cent of the bigger boats landed their catches.

In the Philippines the fishermen themselves, within the limits of their resources, had improved their own landing places. In some cases they had built small wharves and means of transferring their catches to land transport. There was, however, due to fragmentation of the country into 7,000 islands, a lack of adequate road networks. The catch was often collected at sea by fish carrier vessels which visited the different communities and then brought it to one of the commercial ports which were also used for landing fish.

Seo (Japan) remarked that in Japan, improvement of the small ports was of no less importance than the development of larger ones, in view of the great number of scattered fishery communities engaged in coastal fisheries with their small boats. Currently about one-third of the total investment on fishing port improvement was being directed towards these smaller units. The recent development of the culturing industries, e.g. seaweed, pearl, oyster, etc., had also increased the importance of the minor ports.

Wood (Trinidad) observed that most of those working in fisheries did not fully understand or comprehend the magnitude of the problems of the inshore fisherman. Attempts were being made to implant the technological innovations of the large developed countries into the small subsistence-level micro-economic unit. It had been stated that inshore fishing boats operated at a rather low level of productivity. This might be so in comparison with a large modern trawler but compared with the level of productivity within their particular village it would be found that it was relatively high and satisfactory in the circumstances.

There was a sort of universal urge to increase the size of the fishing craft. Who would pay the cost of providing for the larger craft? Invariably the government either directly or indirectly.

Suggestion from Canada

Cormack (Canada) commented on Russell's suggestion for hauling out boats in countries where only beaches were available. Of course this was more applicable to less developed countries which did not have sophisticated wharfs, piers, etc. An endless cable linked to an offshore pile and powered by a shore-based winch had been suggested. There were several reasons why this might be impractical but the thought was interesting and the general idea had merit.

As a follow-up to this idea he suggested that the method employed to transport ferry boats across rivers in New Brunswick might also be worth some study. He would not go into the mechanical details of the system but basically it was a single fixed cable permanently fastened on both sides of the river and powered by the vessel's winch. The advantages were:

1. No operators were required ashore to work the system
2. The vessel's own power acted as part of the transmission
3. The fisherman had full control of the speed and behaviour of the vessel at all times.

Bruski (Poland) reported that Polish ports were now sufficient in size and number for the modern Polish fishing fleet. It was a question of reconstruction of ports and the introduction of the best organization and infrastructure. The main problems to be considered (for the development of small fishing ports) were:

(a) Establishing the optimum throughput capacity of the ports, i.e. the complex of facilities for the serving of ships and cargoes
(b) Determination of the range of necessary functions of fishing ports with the principle of integration and concentration of facilities
(c) Technical and organizational progress in the work of fishing ports.

The problems of ports were dealt with in Poland by research institutes and specialized design bureaux.

Guckian (FAO) told of the beaching systems reported in use in several beaches in Northern Denmark where winches were used with some degree of success in a manner similar to that suggested by Russell. Perhaps engineers could learn from these operations.

SESSION IV

The Application of Hydraulic and Other Model Investigations to Fishery Harbour Design in Japan

by T. Sato

Application des études sur modèle réduit, hydrauliques et autres, au dessin des ports de pêche Japonais

L'auteur démontre l'utilité et la nécessité d'expériences sur modèles réduits pour résoudre divers problèmes techniques que posent la conception et la construction des ports de pêche. Au chapitre 1 de sa communication, il traite de certaines difficultés devant être surmontées lors de la construction portuaire, et expose trois types de solution. Le chapitre 2 est consacré à la nécessité et à la portée des expériences sur modèles réduits en tant que moyen de résoudre le problème. Le chapitre 3 mentionne les caractéristiques des ports de pêche japonais, soumis à des phénomènes naturels tels que typhons, raz-de-marée, ensablement et faibles sols de fondation, ainsi que les divers types d'essais sur maquettes destinés à l'étude de ces conditions. Au chapitre 4 sont décrits les services publics de recherche sur les ports de pêche, les moyens dont ils disposent, les principaux programmes en cours, et les résultats récemment obtenus.

Aplicación a la proyectación de puertos pesqueros en el Japon de las investigaciones hidráulicas y de otras investigaciones de modelos

Este estudio muestra la utilidad y necesidad de realizar experimentos de modelos para resolver algunos problemas técnicos que se han planteado al proyectar y construir puertos pesqueros. El capítulo 1 expone algunos de los problemas que han de resolverse en la construcción de los puertos y muestra que para solucionarlos existen tres métodos. El capítulo 2 examina la necesidad y la significación de los experimentos de modelos en cuanto a métodos de solución. El capítulo 3 indica las condiciones especiales de los puertos pesqueros japoneses, en los que influyen fenómenos naturales como tifones, maremotos, corrimiento de arena, cimientos inseguros, e indica también las varias clases de experimentos de modelos en relación con estas condiciones. El capítulo 4 describe la organización de investigación japonesa oficial encargada de realizar estudios sobre puertos pesqueros, así como las instalaciones y servicios de investigación de que dispone, y describe igualmente los principales proyectos que hay en estudio y los recientes resultados de las investigaciones.

THERE are a great many engineering problems to be solved in the design and construction of fishing ports. When waves are considered, for instance, there are such problems as the wave forces acting on breakwaters, waves overtopping breakwaters, wave run-up on revetments and the transformation of coasts by waves.

In ordinary cases, we can resort to three methods in order to seek solutions to these problems:

(a) Theoretical
(b) Empirical
(c) Experimental

There are problems which may be solved by only one of these methods, and also cases where all three methods must be jointly utilized.

A good example of (a) is that of a standing wave-pressure acting on vertical breakwaters in deep water conditions. With similar wave-pressures acting in the breaker zone, and also where deformed concrete blocks are provided, the problems cannot be solved by theory alone.

The problem of the distribution of wave height in a basin sheltered by breakwaters may be impossible of solution by theory alone, because of interference by reflected waves from breakwaters, quay walls or revetments, as well as by the diffracted waves from the port entrance.

Many of these problems can be solved by empirical methods, but it is considered that the most rational method of solution is the experimental, using hydraulic model tests. This paper outlines, while emphasizing the problems of waves, the significance of model experiments in fishing port design in Japan.

Significance of model experiments

Generally speaking, model experiments refer to the study of models instead of the prototype to obtain a full knowledge of the data obtaining in the prototype. However, there are limits to the use of models including that of cost, time and availability of labour.

Vast expense is involved in providing various coastal structures, and most of them may function, not by themselves, but only in combination with others. The function of a fishing harbour is shown, for instance, only in the grouping of facilities such as breakwaters, channels, facilities for the berthing and mooring at the quay walls. Such facilities, although mattering little in themselves in point of performance and construction, could even without performing any experiment be located satisfactorily to make the harbour calm or to prevent the accumulation of sand drift in the harbour. But the best results may not be obtained through theory alone, because of the complexity of natural conditions. As an efficient method for solving such problems, there is none at present better than the model experiment. The question whether a structure is stable or not may not be known until the actual design conditions required for stability can be provided. Accordingly, the model experiment will prove extremely useful in determining the choice of actual structural sections.

In recent years, thanks to calculation by electronic computer, problems concerning the diffraction of waves or the defence effect of breakwaters against tidal waves or storm tides can be so solved if exact initial and boundary conditions are given. However, these calculations are based on theoretical formula with extremely simplified boundary conditions, and additional comparative study with experimental models is needed to provide workable results.

Therefore, model experiments may be deemed a truly meaningful method for the technical elucidation of various problems.

From the foregoing, the merits of model experiment may be enumerated thus:

(a) In cases where the solution may not be arrived at through purely mathematical analysis, the derivation of empirical formula or the determination of the co-efficient of numerical values
(b) In decisions between alternative layout plans
(c) In the understanding of phenomena whose elucidation is impossible through calculation
(d) In studying phenomena under conditions which may actually but only rarely be experienced
(e) In determining solutions to otherwise unsolvable problems
(f) In reducing construction expenses.

Problems of waves

Fishing ports in Japan combine some unusual features compared with other countries, due to the natural conditions of their location. These include the fact that Japan is an island and that on account of her latitude and longitude she is attacked by typhoons every year. In winter, she suffers high winds from the north-west. There are also districts liable to suffer from tidal waves caused by earthquakes. Consequently, the coast line of Japan may be divided into the following five zones (see fig 1):

(a) Zone of high typhoon
(b) Zone of winter north-west gales
(c) Zone with prevalence of tidal waves
(d) Zones with storm tide risk
(e) Other zones.

A fishing port must, therefore, be planned according to the natural conditions of the area in which it is located. However, it is difficult to determine from theory alone such various phenomena as the extent of turbulence in a harbour basin at times of abnormal weather, or the degree of wave transmission over protective breakwaters.

In solving these problems, and determining the most rational plan, experiments on the wave-sheltering qualities; the stabilizing effects; the degree of overtopping of waves and wave run-up height on the slope, applying mathematical and hydraulic knowledge we now possess of model characteristics, are considered extremely effective methods.

Problems of sand drift

Problems such as the erosion of sand-beaches and accumulation in harbours of sand drift have been studied for a long time, and yet no definite method for their solution has been established so far. A main cause of the difficulty is the fact that the supply or movement process of sand drift is not yet made fully clear, because of this the problem of proportionality in model experiment has not yet been adequately resolved.

Fishing ports are usually constructed in breaker-zone where water is comparatively shallow and where the movement of sand is most striking. Consequently, methods to control sand drift are one of the indispensable study items when constructing a fishing port. In the past many fishing ports incurred great expense in countering sand drift.

In recent years, a variety of experimental studies on sand drift have been carried out and by practical applications, understanding is being gradually achieved.

The problem is one on which both experimental and theoretical study is much needed.

Problems at the port entrance

In fixing the width of the port entrance, study has to be made from the contrary aspects of relative difficulty in entering or leaving for fishing vessels, and of protection afforded to the port facilities. From the navigation standpoint, the wider the entrance the better; but from the point of quiescence, the narrower the better.

In general, the fishery industry desires to extend fishing days as much as possible. The relative difficulty in entering or leaving the port bears a close relation to the number of fishing days. Since the beginning, fishing ports in Japan availed themselves of natural topography as far as possible but there were few without breakwaters. Because breakwaters are often located in breaker zone, even when there are no waves offshore to make fishing dangerous, the wave conditions around the port entrance are often unfavourable. This means that, even with wave conditions which permit fishing offshore, going out of port is not easy, and may necessitate an earlier return. Under such circumstances, the direction of the port entrance as well as its layout bears a very close relation to the number of working days of fishing vessels.

In the past there was no method of studying and deciding the problem scientifically; but this problem should be speedily solved with the advancement of experimental techniques and theory.

Problems of weak foundations

Fishing ports in Japan are scattered along the coastline; many have had to be constructed at technically unfavourable places on account of natural conditions, and some of these have had to be built on weak foundations.

In such cases, there are dangers of the structures suffering from slip failure or differential settlement. Japan is a country with frequent earthquakes, which magnify these dangers. Although some of these problems may be solved through the application of special construction methods or earthquake-proof construction methods, there still exist many unsolved ones. For this reason, there are cases where an uneconomical structure is necessarily adopted for safety's sake. Therefore, in future, it will be necessary to carry out model experiments by means of the large-scale vibration table, simultaneously with the

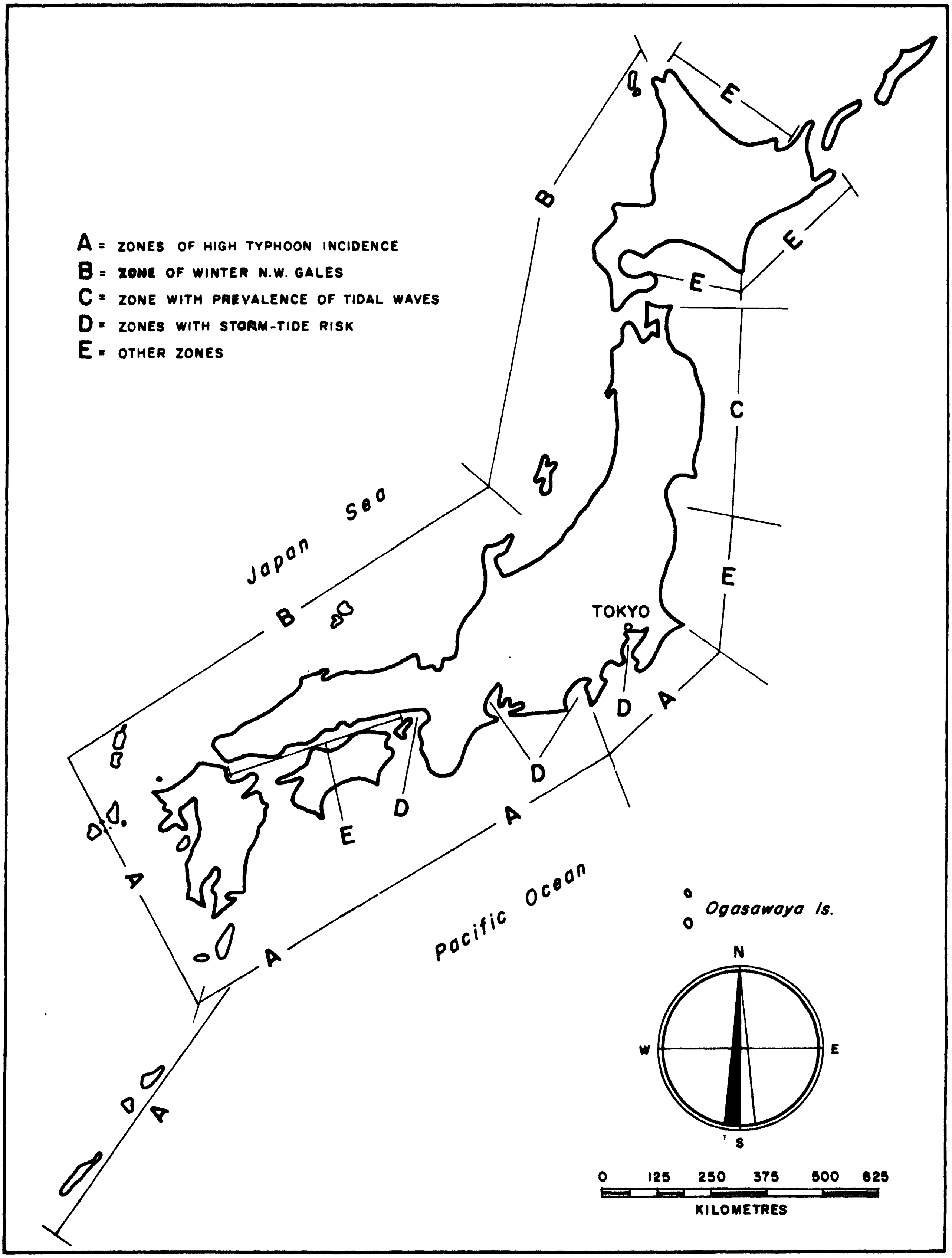
A = ZONES OF HIGH TYPHOON INCIDENCE
B = ZONE OF WINTER N.W. GALES
C = ZONE WITH PREVALENCE OF TIDAL WAVES
D = ZONES WITH STORM-TIDE RISK
E = OTHER ZONES
Japan Sea
Pacific Ocean
TOKYO
Ogasawaya Is.
A
B
C
D
E
N
S
W
E
0
125
250
375
500
625
KILOMETRES

Fig 1. Storm zones on the coastline of Japan

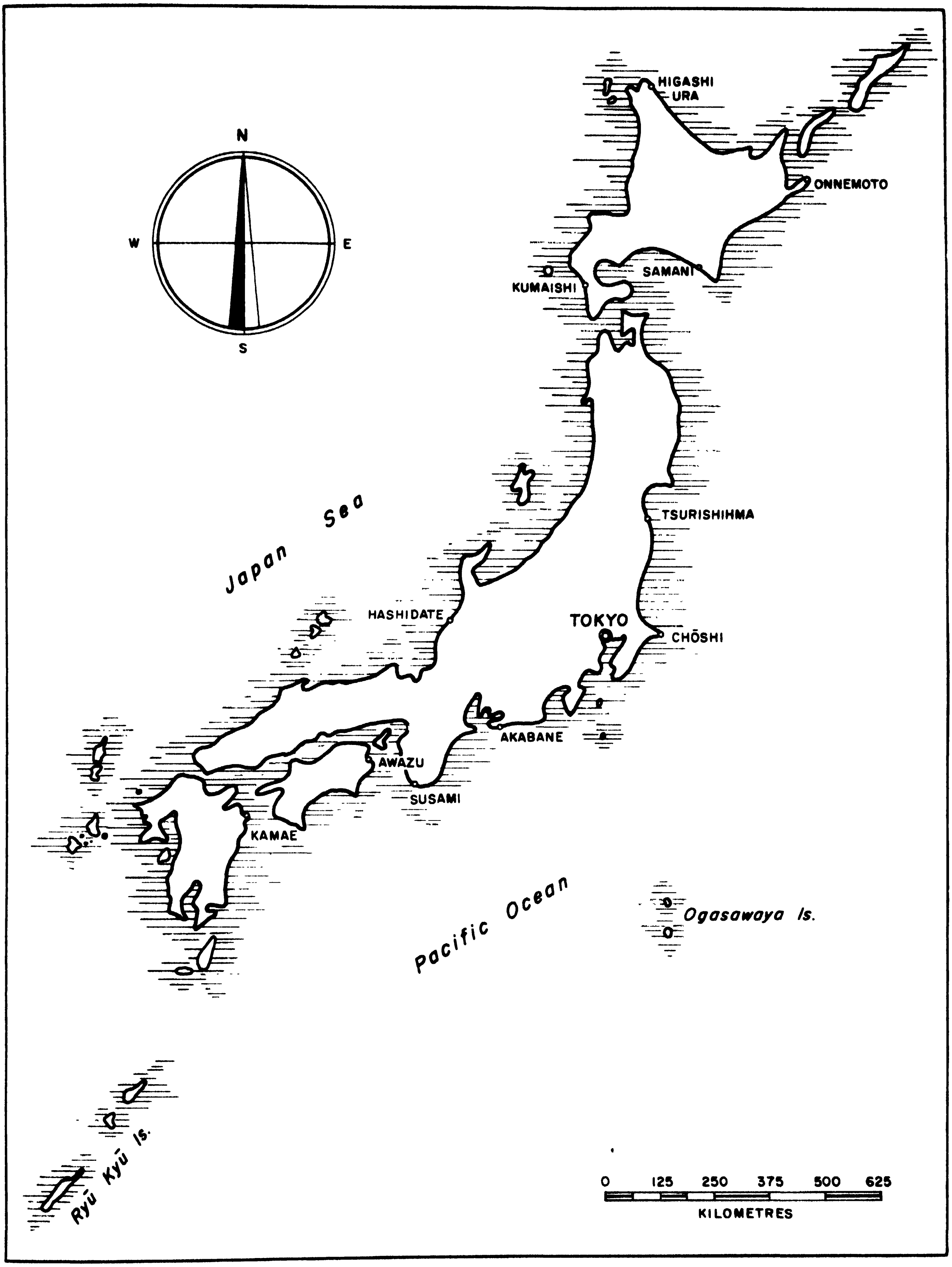

Fig 2. Location of a selection of the 60 Japanese fishing ports for the development of which model investigations were conducted

theoretical analysis, in order to solve outstanding problems.

Other applications

Apart from the above, many other kinds of model experiments may be useful.

A variety of changes in natural phenomena appear around structures provided in the sea or sea coast where there has been no such structure before. That is to say, erosion may begin along a coast hitherto stabilized, or alternatively, sedimentation or accretion may occur. Where there has previously been no wave attack the effect of reflected waves may appear thereafter.

Such situations are often accompanied by serious differences of opinion among the fishermen themselves, or between fishermen and outsiders, as to the construction of fishing port facilities. In such cases, instead of vague explanations, the interested parties may be convinced and persuaded as to counter-measures by model experiments. In many such experiments we have taken part.

OUTLINE OF MODEL EXPERIMENTS

The technical organization of research on fishing ports in Japan is carried out at the Second Laboratory, The Department of Fisheries Engineering, Agricultural Engineering Research Station, of the Ministry of Agriculture and Forestry. The organization of the Research Station is a standard one, and members of the Station engage in the study of problems in co-operation with other departments, and with members of other laboratories when necessary.

The Second Laboratory employs 13 staff, consisting of six research workers (all civil engineering experts) and seven assistant personnel. The sphere of activities covers not only the basic study of fishing ports, but as there exist no other technical study organizations on fishing ports in Japan, various experimental research and technical advice on problems requiring speedy solution at the request of fishing port construction authorities also forms part of the service.

Research facilities

Facilities exclusively used by the Second Laboratory of the Fisheries Engineering Department include two basins and two channels (one basin is rectangular: 25 m (82.5 ft) long, 35m (115.5 ft) wide and 1.0 m (3.3ft) deep, another is fan-shaped; 35 m (115.5 ft) long, 50 m (165 ft) wide and 1.0 m (3.3 ft) deep, a large scale wave channel: 50 m (165 ft) long, 2 m (6.6 ft) wide and 2 m (6.6 ft) deep, and a small scale wave channel: 35 m (115.5 ft) long, 1.0 m (3.3 ft) wide and 1.0 m (3.3 ft) deep). As indicated in Table 1, various other experimental facilities are provided in the Station compound, and are utilized when necessary.

On the side of the rectangular basin, a self-powered observation truck is equipped to collect data when an experiment is in progress so that the wave-generator mechanism, observation truck and recording or collecting of test data may be managed completely by one man in the control chamber at one end of the observation truck.

The fan-shaped basin and the small scale wave channel are both provided with a return current system, by which not only separate tests on waves and current but also tests on both waves and current simultaneously, may be performed.

Among the special measuring instruments, there is the sand-surface metre which is used for the model test on the movement of sand.

This has been devised to avoid the undesirable result of access on to the model floor of test personnel during and after the observations, since the test result may be disturbed by such traffic. By this device, test results may be obtained continuously from the observation truck.

Besides the above, though not exclusively used by the Second Laboratory, there are, in the Station, a large scale wave-channel (100 m (330 ft) long, 2 m (6.6 ft) in depth and width) with wind tunnel (wind generator capacity 30 m/sec (100 ft/sec) and a large scale model basin (100 m (330 ft) in length and width) with a tide and storm surge generator of the pneumatic type, and a littoral current generator. Hydro-physical experiments concerning various forms of waves are performed with these devices.

Principal problems under examination

A number of problems concerning fishing ports, the principal items in our present programme are here discussed,

Recently, in Japan, many deformed blocks have been deposited in front of various coastal structures such as breakwaters, to reduce the large wave forces acting on breakwaters, to increase their stability and to lessen the wave run-up on the slope of breakwaters.

Although a considerable number of experimental results have been reported concerning the functions of various deformed blocks, wave-pressure formulae or formula for determining the levee crown height of breakwaters, etc. (which may be conveniently used in the actual design of structures), have not yet been resolved. This study seeks to determine a new formula and make a standard design by systematic experiment using deformed blocks.

Transformation waves. The theory of transformation wave forms now generally used is mostly concerned with the state before breaking. However, in the case of fishing ports where the location of the structure is in the breaker zone or near it, knowledge about the state of waves after breaking is necessary. This study is fundamental for the above purpose.

Diffractive waves. To keep a basin quiet by the effective location of breakwaters is one of the exceedingly important problems in fishing port planning. The quietness in the basin is chiefly determined by the waves coming from the ends of or gaps in breakwaters. Additionally, the conditions of waves at each point in the basin are fixed by phenomenon generally called diffraction.

On this diffraction phenomena, some theoretical analysis and diffraction figures have been already published, but in the case of fishing ports with small basins, it is not possible to make use of the diffractive figures without modification.

The object of this study is to find a method to predict the degree of quietness in the basin to a reliable extent without model experiment. By choosing some typical fish-

TABLE 1. HYDRAULIC MODEL FACILITIES IN THE AGRICULTURAL ENGINEERING RESEARCH STATICN

NAME OF FACILITIES	DIMENSIONS			STRUCTURE	ATTACHED FACILITIES							
					WAVE GENERATOR					OTHER FACILITIES		
	Length m.	Width m.	Depth m.		Type	H. P.	No. of units	Wave heigt	Wave period	Name	Type	Capacity
Wave channel with wind tunnel	100	2	1.8	R. Concrete partially glazed	Piston	25	1	$0-0.4^{m}$	$0.5 - 4^{sec.}$	Wind tunnel	Suction	Wind velocity = $0 - 30\ ^{m}/sec.$
Small scale wave channel	26	0.6	0.8	Glass on one side	Flap	5	1	$0-0.4^{m}$	$0.4 - 4^{sec.}$	Random wave generator		
Constant head tank	4	4	1.25	Steel								
Large scale model basin	100	70	1.2	R. Concrete	Plunger	15	8	$0-0.25^{m}$	$0.2 - 3^{sec.}$	Tidal and storm surge generator	Pneumatic	Max. Vol. of charge and Discharge= 350 m^3 Max. flow = 4.5 m^3/sec.
Small scale model basin	20	20	0.6	R. Concrete	Piston		1	$\sim 0.3^{m}$	$0.2 - 5^{sec.}$	River and littoral current generator	Suction	Max. flow = $600\ ^{l}/sec., 400\ ^{l}/sec.$
Wave channel	100	0.6	1.0	R. Concrete	Piston	10	1	$\sim 0.2^{m}$	$\sim 2^{sec.}$			
Wave channel	40	1.5	1.2	R. Concrete	Flap	10	1	$\sim 0.2^{m}$	$\sim 2^{sec.}$			
Water channel with flood flow generator	75	4	1	R. Concrete						River current generator	Suction	Max. flow = $200\ ^{l}/sec.$
Aqui-culture experiment wave channel	32	1.5	2.2	R. Concrete	Flap	5	1	$\sim 0.3^{m}$	$0.5 - 2^{sec.}$			
Aqui-culture model basin	50	30	1	R. Concrete	Flap Flap	10 20	1 1	$0.05 \sim 0.25^{m}$	$0.6 \sim 2.3^{sec.}$			
Deep wave channel	40	1.5	3	Steel	Flap	10	1	$\sim 0.6^{m}$	$1 - 5^{sec.}$			
Fishing port model basin No. 1	35	25	1	R. Concrete	Piston		1	$0.03 - 0.2^{m}$	$0.6 - 2.4^{sec.}$	Automotive observation truck		
Fishing port model basin No. 2	40	60	0.7	R. Concrete	Plunger	10	5	$0.03 - 0.5^{m}$	$0.3 - 3^{sec.}$			
Fishing port experiment wave channel	55	2	2	R. Concrete	Flap		1	$\sim 0.5^{m}$	$0.8 - 5^{sec.}$			
Fishing port experiment wave channel	30	0.7	0.7	Glass on both sides	Plunger		1	$\sim 0.2^{m}$	$\sim 2^{sec.}$			

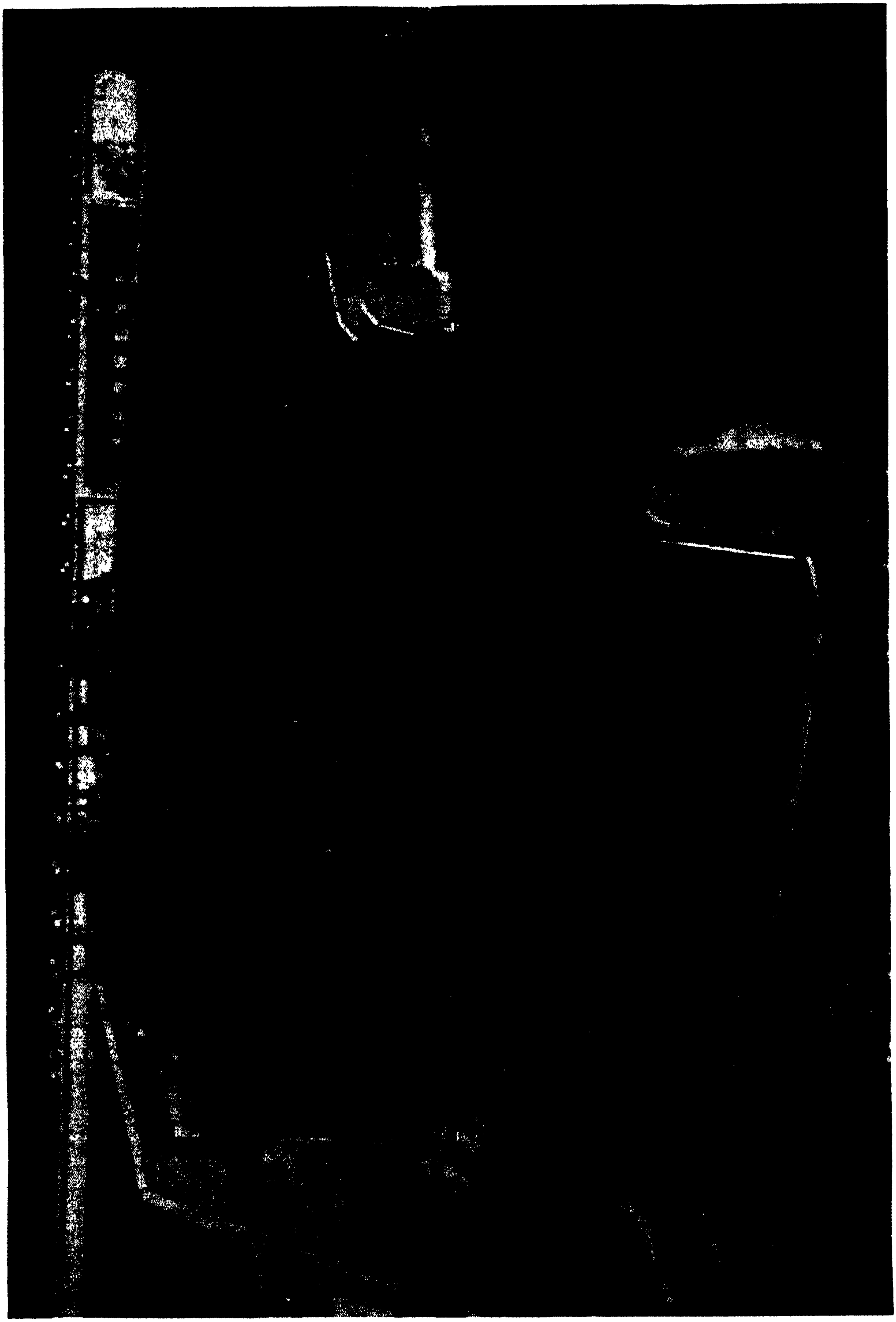

Fig 3. Model for the study of wave reduction by breakwaters

Table 2. Model experiments conducted prior to fishing port construction 1965–1968

LOCATION	PURPOSE OF MODEL INVESTIGATION	METHOD OF EXPERIMENT	INVESTIGATION DETAILS						
			EXTENT OF AREA INVESTIGATED				WAVE PARTICULARS		
			MAXIMUM WATER DEPTH m	DIST FROM COAST TO MAX DEPTH m	LENGTH OF COAST-LINE m	SCALE	HEIGHT m	PERIOD sec.	DIRECTION
INATORI	1 To determine the location and length of breakwaters for better utilization of the water area in the existing port.	1 Models of the actual topograph were constructed in the experimental basin, in which the breakwaters were then added with various locations, directions and lengths	-20	850	600	1/50	-	-	-
MUROTOZAKI	1. To determine a system of breakwater and port facilities to give a max wave height of 0.5 m in storm conditions 2 Studying the effect of removal of structures on existing anchorages and basin	(ditto)	–	–	–	1/50	3.0 7.5	10.0 16.0	SSW SW W
SUSAMI	(as 1 above) 2 Study of effect of the new construction on facilities and adjacent coastline	(ditto)	–	–	–	1/50	3.0 6.0	10.0 14.0	SSE SW W
TSURISHIHAMA	(as 1 above)	(ditto)	–	–	–	1/50	3.0	10.0 12.0	NE E
CHOSHI	1 To determine a system of breakwater and port facilities to give a max wave height of 0.5 m in storm conditions 2 To prepare the layout and dimensions of breakwaters to permit safe entry and exit during storms	(as 1 above) 2 With an automatic model vessel the change of wake, was examined under a variety of waves and patterns of breakwater. This determined the entry route for vessels	-10	800	1200	1/50	6.0 3.0	10.0 14.0	N NE
HASHIDATE	Determination of location and length of offshore breakwaters to provide safe entry conditions	(as 1 + 2 above)	-10	500	800	1/50	3.0 5.0	6.0 10.0	W NW N
AKABANE	1 To determine a system of breakwater and port facilities to give a max wave height of 0.5 m in storm conditions 2 Study of effect of breakwater system on drift and remedial action required	(as 1 above) 2 Mobile bed model was constructed using sand from site. Drift and sedimentation studied.	-15	800	900		1.5 5.5	9.0 14.0	S SSW
KAMAE	Study of structural details and sheltering effect of breakwater in the protection of pearloyster aqui-culture facilities	(as 1 above) 2 The examination of breakwater structural design was carried out in a wave-channel using trial and error methods	–	–	–		3.0 6.0	12.0 14.0	S
AWAZU	To decide the construction details of an offshore breakwater of the submerged embankment type	Models of offshore breakwater of concrete blocks in various shapes were constructed in the wave-channel. Experiments carried out concerned such problems as the wave-damping effect and stabilization of the breakwater.	–	–	–		3.0 4.0	8.0 10.0	SE

ing ports, where the relation between the arrangement of various port facilities and basin quietness will be empirically obtained, these results will be compared with those obtained from model experiments in each port.

Secondary waves. There are many cases in which the waves coming into the basin over the breakwater cause secondary waves, which, working together with diffraction waves from the port entrance, considerably disturb the quietness in the basin.

Especially when the port is so narrow in area that fishing boats are moored near to the breakwater, the problem of secondary waves is of particular significance. The magnitude of secondary waves is not easily estimated, since such factors as the condition of the waves in front of breakwater, the tidal level, the height and width of the breakwater as well as the structure of the breakwater itself, interact with each other.

The object of this project is to make a systematic study of these subjects and obtain a method for determining the suitable levee crown height of breakwaters.

Hydrographical features. With regard to various hydraulic model experiments with fixed bed models, many experiments have been carried out after the similitude law has been fixed to the extent required for practical purposes, and it is confirmed upon actual field verification that the result of the experiments coincides quite well with real phenomena.

However, in regard to the experiment on the mobile bed using sands, which aims at studying the movement of sands principally by wave action, at present no definite similitude law exists. This makes the solution of problems concerning sand movement more difficult.

This study seeks to obtain a guide to the determination of a similitude law (law of proportionality) for experments on the mobile bed using sand through systematic study and research on the phenomena of sand movement (especially at points shallower than the breaker zone) as well as the phenomenon of sand movement in wave-channels.

Offshore breakwaters. The construction of a jetty and offshore breakwater is considered an efficient means of preserving the natural sea shore as an area for fishery production activity and other shore developments.

With jetties, the standard for planning length and spacing is roughly indicated by practical considerations.

For off-shore breakwaters, however, no adequate standard for planning has been determined. This study seeks to develop suitable standards for the layout and design of both jetties and breakwaters.

Location of breakwaters. Generally speaking, improving the quietness of a basin conflicts with the provision of a safe entrance for a fishing port. The resolution of this conflict can involve making a difficult decision.

It is exceedingly difficult to solve this problem theoretically, because the waves near the port are shallow-sea waves or breakers, additionally complicated by the effects of breakwaters or sea-coast topography near the port. Even assuming that a theoretical explanation is provided by the model of a certain port layout, it has the drawback of lacking universality on account of the dissimilarity of each fishing port in form, coastal topography and wave conditions.

As a result, in the past, empirical considerations have determined the width, the direction of the port entrance and the length of the breakwater. To solve these problems scientifically, a variety of experiments have been carried out on the relation of port entrance and navigation using also models of fishing vessels.

Pollution preventing. In a fishing port, the pollution of basins, chiefly through the throwing away of fish and molluscs, is creating a problem. As a preventive measure for avoiding pollution there is the chemical disposition system, or the artificial one with lock-gates, but the study now under way is principally concerned by studying the arrangement and structure of breakwaters, and the location of the port entrance in relation to tidal or other currents, to facilitate the exchange of water in the basin thereby preventing the pollution of water in the port.

PRINCIPAL RESULTS OF STUDY

The principal hydraulic model experiments and research performed concerning fishing ports during these past three years are as shown in Table 2. Fig 2 shows the major fishing ports where construction, on the basis of model experiments is in progress.

CONCLUSION

In future, in order to solve many remaining technical problems on fishing port development, it is considered necessary to promote the development of new techniques and of theoretical analysis by introducing electronic computers. Model experiment will then become a more powerful tool in solving many problems.

The Study of Harbours Using Hydraulic Models

by C. de Campos Moraes

Etude des ports sur modèle réduit

La communication signale l'importance économique que revêtent dans l'établissement des plans d'un port les études hydrauliques sur modèles réduits. L'auteur mentionne les problèmes de similitude—géométrique, cinématique et dynamique—dont la solution est essentielle dans l'hydraulique des modèles réduits. Il indique aussi plusieurs éléments secondaires susceptibles de compliquer la tâche: viscosité, tension superficielle, force de la mer, et effets d'échelle de diverses caractéristiques. Après avoir exposé des détails relevant de la technologie expérimentale—notamment construction du modèle réduit, générateurs de vagues, filtres et autres absorbeurs d'énergie, instruments pour la mesure de la hauteur des vagues, dispositifs pour reproduire les marées—l'auteur décrit brièvement le résultat d'études sur l'action des vagues, la stabilité, la résonance, les transports de sédiments, en donnant des exemples précis.

Enfin, il cite un exemple représentatif d'abaissement du coût des travaux grâce aux résultats de l'étude sur modèle réduit.

El estudio de puertos con modelos hidráulicos

Recalca el autor la importancia económica que en la construcción de un puerto tiene la ejecución de estudios de modelos a escala. Alude a problemas de analogía: geométricos, cinemáticos o dinámicos, que son fundamentales en la técnica de los modelos a escala. Se ocupa de diversos factores secundarios que podrían complicar tal estudio, como la viscosidad, tensión superficial, rugosidad y efectos de la escala de diversas características. Da detalles relacionados con la tecnología experimental, inclusive la construcción del modelo, generadores de olas, filtros y otros dispositivos que absorben energía, instrumentos para medir la altura de las olas y sistemas para reproducir las mareas. Describe brevemente, con ejemplos específicos estudios de la acción de las olas, estabilidad, resonancia y acarreo de sedimentos.

Indica un ejemplo típico de la reducción de los costos de las obras gracias a los resultados obtenidos en la investigación de modelos.

THE construction of a harbour involves considerable expenditure. But the choice of a suitable site can benefit the economy of a country by bringing in considerable income. So the study and planning of a harbour deserves the closest care and attention.

This paper summarizes the reasons favouring the study of projected harbours by scale models, and it details the principal problems arising from this technique.

Why is a theoretical study of the question not enough? In the first place, because the combination of phenomena which can occur and influence the project is far from simple, and the phenomena do not act independently: the equations to which they give rise are difficult and slow to resolve and their resolution is not always possible. In the solving of equations, computers can render invaluable assistance because numerical calculations can be made very rapidly. It is used in certain fields of Marine Hydraulics (Barailler and Gaillard 1967), for example in the calculation of "wave patterns", which represent the refraction undergone by waves in their propagation until impinging on the coastline. But the number and nature of the variables which determine each phenomenon are not always known. That is the reason why we resort to scale-models as an aid to the study of most hydraulic problems. It is the safest, most efficient and most economical way of testing a project which is in the final planning stage, or an installation, already built, which has to be enlarged, or is inefficient in its present performance.

The siting of a harbour offers several types of problems which can be studied in scale-models. Take the example of a length of coast where it is intended to construct a harbour. The first question which generally arises concerns the alteration of the equilibrium of the alluvium. Such alteration can have two effects: one, the erosion of areas which cease to be fed by the former continuous flow which tends to be held up by the marine construction; the other, the possibility of the silting-up of the harbour-area. There is, in consequence, nearly always the necessity, in both cases, of initiating a scale-model **movable-bed study.** Another example, assuming that the sea and swell characteristics of the locale are known (currents, wave periods and heights, the respective spectra, diagrams of refraction and diffraction, etc.) there are still two kinds of studies to be carried out on scale-models: stability-tests of breakwaters and slopes and **surge action studies** inside the harbour and in the proximity of the harbour entrance. These experiments are made with **fixed bed models.** A third problem might arise when there are **resonance phenomena** which should be eliminated.

Harbours located in estuaries or lagoon formations must also be studied in relation to river problems. In these cases the simulation of the tide is a very important factor considering that it is the prism of the ebb tide which fundamentally conditions obtaining the depth necessary for navigation. A calibration with a scale-model of the movable bed allows the physiographic development to be determined in relatively short spaces of time, thus allowing the most appropriate modifications to be studied.

THE TECHNIQUE OF THE SCALE-MODEL—QUESTIONS OF SIMILARITY

The first notion of using scale-models for the study of hydraulics goes back to Sir Isaac Newton who in 1686, in his "Principles", devotes a paragraph to similarity (Dixon 1949). It was only in the 19th century, however, that the technique of the scale-model developed, thanks to studies concerning similarity made by, amongst others, Froude and Reynolds, and only lately was technique of study by means of a model applied to Marine Hydraulic since the characteristics of waves are only now being determined with sufficient accuracy.

The reproduction of hydraulic phenomena by means of a scale-model is closely connected with the definition of three types of scales:

$L_r = \frac{L_m}{L_p}$ GEOMETRIC SCALE L_r, which is the quotient obtained between the linear dimension L_m of any geometric size of the model and the homologous dimension of the prototype L_p.

$T_r = \frac{T_m}{T_p}$ KINEMATIC SCALE T_r, which is the quotient obtained between times T_m and T_p which homologous points take to travel homologous distances, both in the model and the prototype.

$F_r = \frac{F_m}{F_p}$ DYNAMIC SCALE F_r, which is the quotient obtained between forces F_m and F_p which act on homologous points in the model and in the prototype.

From the constancy of each of the three scales result three distinct types of similarity: geometric, kinematic and dynamic.

The forces that intervene in hydraulic phenomena, apart from that of inertia, are the forces of gravity, viscosity, surface tension and elasticity. In almost all hydraulic problems there are variations of velocity and in consequence the forces of inertia must obey a well-defined dynamic scale. From Newton's second law

$$F = Ma$$

it follows that

$$F_r = \frac{F_m}{F_p} = \frac{M_m}{M_p} \cdot \frac{a_m}{a_p} = \frac{\rho_m}{\rho_p} \cdot \frac{V_m}{V_p} \cdot \frac{a_m}{a_p} = \rho_r V_r a_r$$

Where: M is the mass of a volume V of fluid of specific mass ρ which, subject to force F acquires the acceleration a. The indices m and p refer, respectively, to the model and prototype. Considering L as of characteristic length,

$$F_r = \rho_r L_r^4 T_r^{-2}$$

if, besides the similarity of the forces of inertia, there is a need to respect the forces of gravity, it is necessary that the dynamic scales be the same. Given the scales of the forces of gravity and of the weights of homologous particles,

$$F_r = \gamma_r (L_r)^3$$

and, equalling the third and fourth equations, considering that $\gamma_r = \rho_r g_r$, we obtain

$$T_r = \sqrt{\frac{L_r}{g_r}}$$

considering $g_r = 1$ will be

$$T_r = \sqrt{L_r}$$

which is the expression which formulates Froude's well-known *Law of Similarity*, valid for the problems most frequently met with in Marine Hydraulics.

Given that the kinematic scale be equal to the square root of the geometric scale and the scale of weights

$$P_r = \gamma_r (L_r)^3$$

it is seen that the geometric scale Lr conditions, in both cases, the ability to reproduce, in scale-model, the phenomenon or phenomena of the kind to be studied.

The choice of the geometric scale, besides being, obviously, related to the space available for the construction of the model, is not, however, independent of some of the following secondary factors (Castanho 1953).

(a) **Influence of viscosity.** As a wave propagates, its amplitude decreases due to the dissipation of the energy of the particles as a result of viscosity. If, as has been said, it is Froude's similarity that governs the scale model study of almost all the problems of marine hydraulics, any type of force, excluding inertia or gravity, is not reproduced on the same dynamic scale. From this results a **scale effect** relative to the force of viscosity. The influence of this is felt more intensely the smaller the scale, according to a damping law which stays practically constant above a certain range of values of the scale (depending on the relative depth $\frac{d}{L}$) but which shows a steeper gradient for values corresponding to very small scales. Geometrical scales equal to 1 : 100 or greater are normal in marine hydraulic tests. Scales lower than 1 : 150 are only found in distorted models.

(b) **Influence of surface tension.** The forces of surface tension influence the wave speed. Nevertheless, it is only for very small values of wave length L that capillary forces can exert an influence in the increase of the wave speed C. For example, if $L = 10$ cm, the increase in C is only 1.5 per cent. Thus the influence of surface tension can, for all practical purposes, be disregarded in normal tests. It is, however, essential that the water be clean, because any dirt whatsoever can increase considerably the effect of the surface tension.

(c) **Influence of roughness.** This is a factor which attains scarcely any importance in shallow waters. Within the range of error usual in these works the effect of roughness on the propagation of the wave can be ignored. In studies involving waves with a long period this problem starts to become important.

(d) **Scale effects.** If, as has been said, it is the "similarity" of Froude which governs the scale study of marine hydraulic phenomena, it must be hoped that the forces of viscosity, surface tension, elasticity, etc., when playing an important part, should make their presence felt differently according to the scale on which the experiment is being performed. Reflection, diffraction, overtopping, etc., show scale effects, capable at times of paradoxical interpretation, seeing as this is, as yet, a rather virgin field of study (Greslou 1957).

The geometrical scales in which agitation studies are carried out are never less than 1 : 200, 1 : 100 being the value normally used at the LNEC.

In movable bed studies the horizontal and vertical scales do not coincide. Some of the reasons which determine the distortion are:

(i) The necessity of maintaining in the model a rough turbulence flow of such an order that the influence of viscosity is independent of the "Reynolds number"

(ii) The impossibility of reproducing to scale the roughness of the prototype

(iii) The need to use, in the model, materials of different density from those of the prototype for sediment transport studies

The horizontal scale of a distorted model can vary in Marine Hydraulics from 1 : 250 to 1 : 1000 according to the degree of distortion, which is usually between 3 and 10.

EXPERIMENTAL TECHNOLOGY

The first step to take before commencing the study of a harbour with a scale-model is to be familiar with the problem or problems to be resolved. The fundamental elements are those data of the prototype which will have an influence on the study, e.g., the hydrographic details of the area bordering on the site where the harbour is to be created, which will permit the construction of the model, and the drawing of refraction diagrams that will render possible the determination of the direction of the wave from off-shore up to the position where it is intended to site the wave generator, and in addition the deep-water wave characteristics: amplitude, period, direction, etc.

Particulars concerning tides are indispensable for reproducing the levels of the "static" tide which are used in fixed bed models and of the dynamic tide which are applied in movable bed models. In the latter it is also necessary to know particulars about sediment transport conditions in nature.

Once in possession of the data necessary to reproduce the project details, in model form, it must be constructed in an appropriate type of wave tank. There are several techniques for constructing models, the most common consisting of the creation of a model pattern from topographic sections (the method used at DSIR Wallingford), or following the prototype contours (method used at LNEC). In both cases the model is filled with sand and covered with cement (fig 1a).

Fig 1a. Fixing steel rod contours in the construction of a scale model

In any study with a scale-model the boundary conditions are important because only the portion of coast reproduced and the harbour have a counterpart in nature;

Fig 1. Constructing a scale model of a breakwater

neither the paddle of the wave-generator nor the tank walls possess characteristics homologous to the prototype. It is therefore necessary that waves returning to the open sea should dissipate their energy as it occurs in nature. For this reason lateral energy absorbers are employed (beaches of rubble or other absorbent materials) and filters placed close to the paddle (or even attached to the paddles, as, for example, in the Laboratory of Chatou). These filters are also intended to purify the incident wave by absorbing its harmonics. Biesel (1948) shows that if a wave of L length is reduced in amplitude in the proportion of n (expressed in percentage), a wave of $\frac{q}{L}$ length is reduced in the porportion ${}_nK\frac{3}{4}$ (Le Méhauté 1965).

The wave-generating devices used in the laboratory can be of the "snake" type (paddle divided into several parts that can move independently and out of phase according to pre-established patterns, to produce different wave-directions) of the "single paddle" type (solely executing rotary movements) or the pneumatic type (in which alternating differences of pressure within chambers create the waves) (Biesel 1954; Biesel and Suquet, 1951 and 1952; Castanho, 1953; Smith, 1963).

The names and characteristics of the measuring apparatus most frequently used by the Marine Hydraulics Divisions of the LNEC are as follows:

(a) **Probes**
  (i) a metal pointer mounted on a graduated shaft, in association with a cathode eye: this is a simple instrument to measure the height of the wave and adjust the water-level
  (ii) resistance probes, based on the principle of Wheatstone's bridge and on the variation of resistance produced by the difference of level of the water at the two arms of the probe
  (iii) capacity probes composed of condensers in which the armatures are represented by copper wires wound on a metallic frame and by the water, and the insulator is the protective varnish on the copper wire.
(b) **Amplifiers (Unitron),** which amplify the signal given by the probe
(c) **Recorders** (Sefran, Moseley) that register a graphic trace of the wave movements
(d) **Sounders,** automatic bi- or tri-axial transporters that permit continuous soundings to be carried out. They are employed to register the systems of stationary waves (determination of nodes and antinodes in "clapotis") and in the topographical survey of the bottoms of the models
(e) **Limnigraphs,** that record tidal curves
(f) Tide-reproducing systems, etc.

SURGE-ACTION STUDIES

The purpose of surge-action studies in harbours, using scale-models, is to know the degree of agitation prevailing inside the harbours when subject to known external storm conditions, in respect of wave-direction, amplitude and period. Three phenomena are especially important: the **refraction** provoked by depths (also called frontal expansion of energy), the **diffraction** (or lateral expansion of energy) caused by external breakwaters and other internal obstacles and the **reflection** undergone by the wave when coming into contact with the slopes of the boundaries and of the breakwaters.

These phenomena can occur jointly or independently. Problems arising from the breaking of the wave, its run-up over beaches and slopes, and its eventual overtopping are aspects of considerable interest in the studies of agitation.

A study of this type is carried out with one or several "static" tide levels, chosen so as to represent the worst conditions of agitation which may occur in nature. This factor is important, for example, in the study of the breaking of the waves which can cause the greatest or the least agitation within the harbour. The same criterion of choosing the most unfavourable conditions existing in the prototype should also be adopted to choose the heights, directions and periods of wave which are reproduced. In most cases it is sufficient to choose one or two wave heights to obtain an "index of agitation" (or "of shelter") at a point

$$i = \frac{H_i}{H_e}$$

Where H_i is the inside height at that point and H_e the outside height.

For a surge-action study to be well conducted it is fundamental to know the projected level of utilization of the various areas of the harbour—this information to be supplied by the authority who have initiated the study. It is in these zones of utilization that the prevailing agitation should be known as accurately as possible. It should be emphasized that the study should not be limited to the reproduction of only one wave period, because the occurrence of resonance must be taken into account.

Every harbour lay-out has its own characteristic degree of agitation within its structures. The studies to be carried out would therefore consist of:

(a) Determining the qualitative and quantitative aspects of this agitation
(b) Determining whether the values that are obtained are compatible with the maximum values required are compatible with the maximum values required by the planner
(c) Conducting tests on various modifications of layout to get to know the degree of agitation resulting from each one
(d) Interpretation and presentation of the respective results so that a solution can be chosen which best satisfies the economic aspects and the required degree of protection within the harbour.

Three examples of agitation studies carried out by the LNEC are given below.

The Port of Vilamoura (fig 2) will be built in the Algarve (on the south coast of Portugal), where wave action is weak since violent storms rarely occur. It is worth noting that the geometric irregularity of its outline does not favour resonance.

The experiment was limited to determining internal agitation. As the results obtained fully satisfied the requirements regarding the maximum permissible wave it was not necessary to seek alternatives.

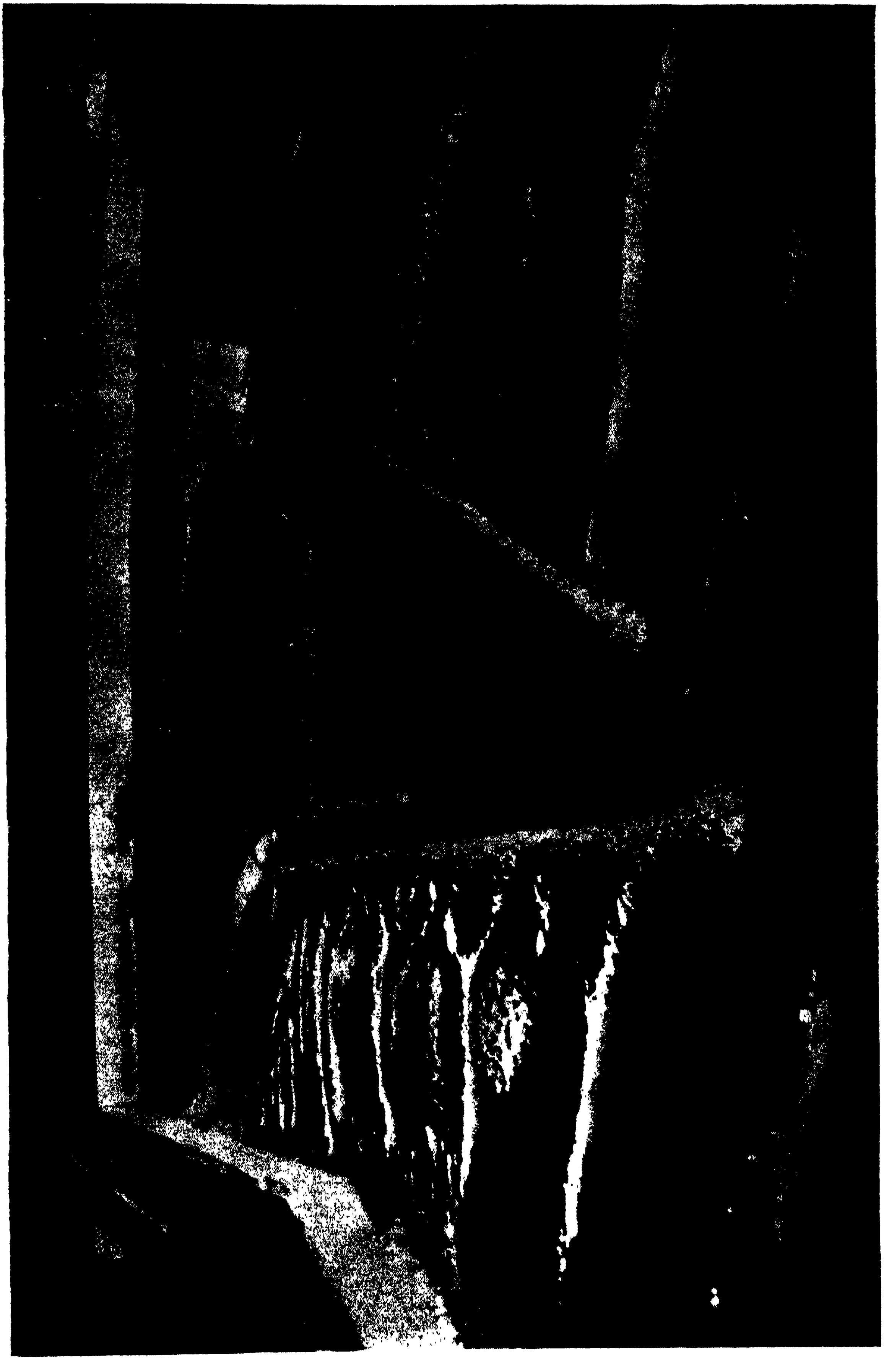

Fig 2. Scale model of the harbour of Vilamoura

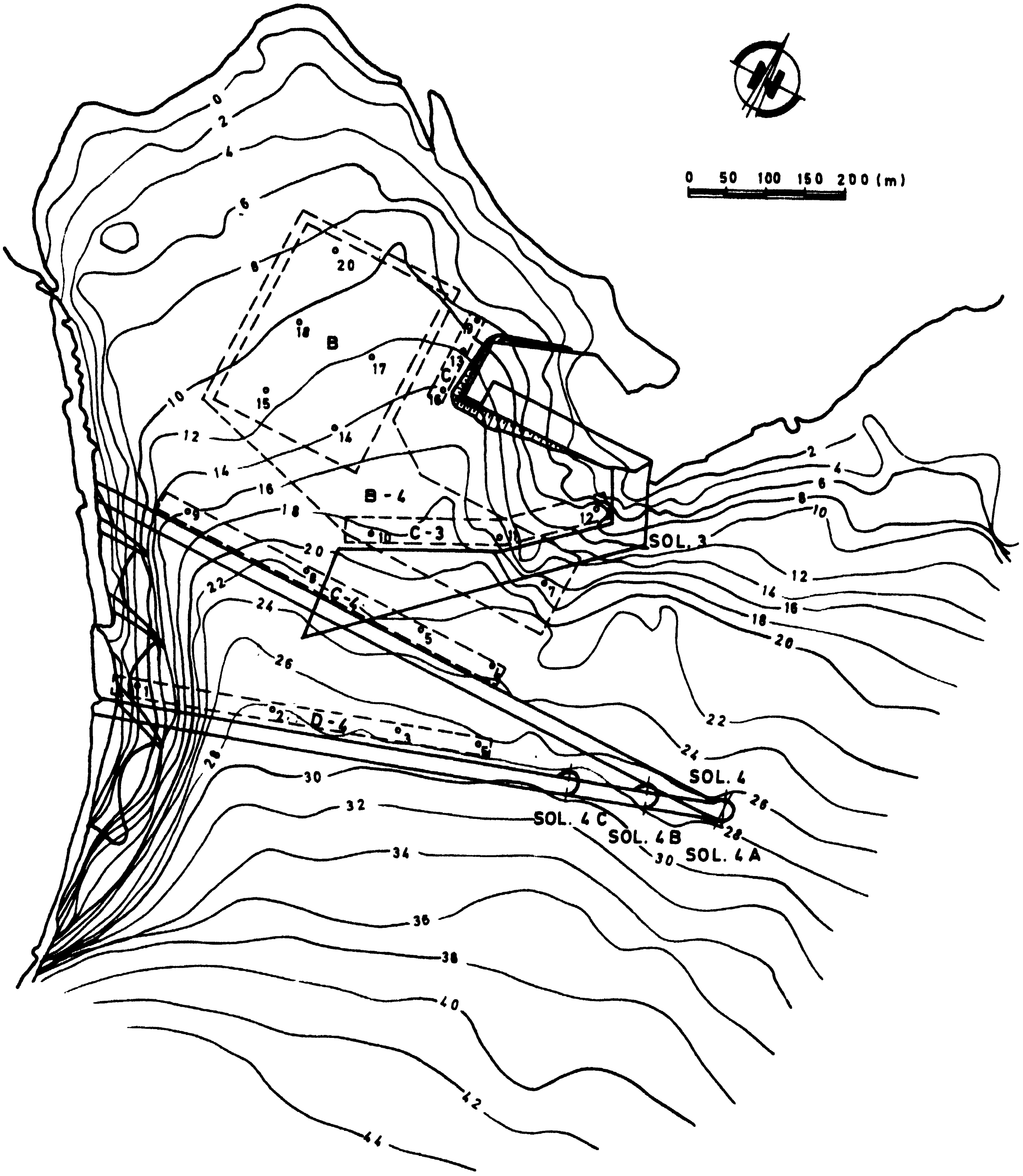

Fig 3. Plan of the harbour of Angra do Heroísmo showing different studies

The Port of Angra do Heroísmo (fig 3) is in the Island of Terceira in the Azores Archipelago. Its study was noted for the multiplicity of possible solutions to be examined, a few of which are mentioned:

Solution 3: hydrodynamic breakwater of triangular form constructed near the Porto de Pipas quay (already existing) and the protection of the west coast by groins and rubble beaches to facilitate the dissipation of energy. This solution, recommended in 1948 by the Hydraulics Laboratory of Lausanne University, was satisfactory for storms blowing from the South but was found decidedly unfavourable for storms from the South-East.

Solution 4: breakwater constructed nearby on the cliff of Monte Brasil.

Solution 4A: a variant of the previous solution with construction 270 m (891 ft) south of solution 4

Solution 4B: a variant of solution 4A consisting in shortening by 100 m (330 ft) the total extension of the breakwater

Solution 4C: the same, except that the breakwater was shortened by 200 m (660 ft)

Tests with scale-models indicated that solution 4A was the one affording conditions of greatest calm.

The Port of Peniche (fig 4) study is still under way at the LNEC. It deals with the lengthening of the West breakwater so as to protect the interior of the harbour from storms coming from the South. Three alternatives were considered:

Solution 1: the lengthening of *W* breakwater by 250 m (825 ft).
Solution 2: the lengthening of *W* breakwater by 250 m (825 ft) and shortening of *E* breakwater by 100 m (330 ft).
Solution 3: the lengthening of *W* breakwater by 350 m (1,155 ft).

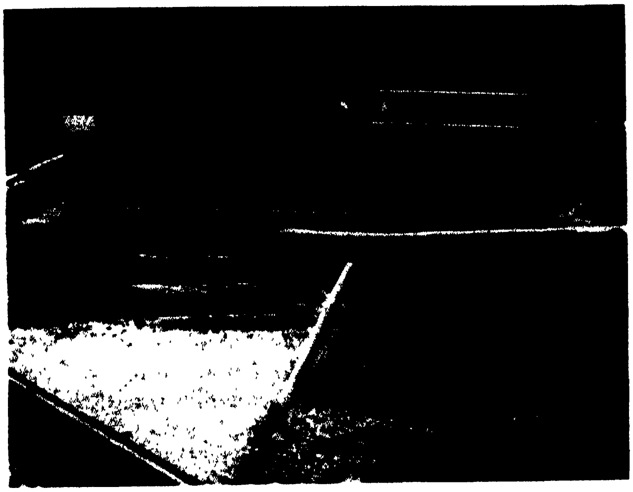

Fig 4. Scale model of the Port of Peniche—wave action study. Note at the rear, the wave-generator. The West breakwater is the one nearer to the generator

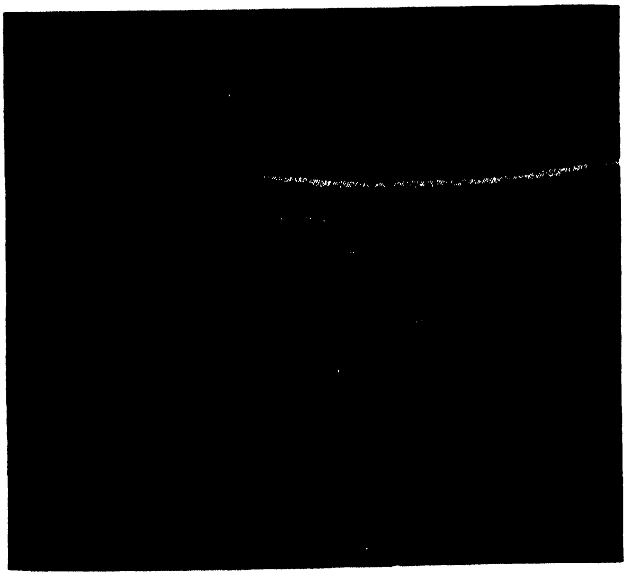

Fig 4a. Detail of entrance to harbour from the scale-model of the harbour of Peniche. Note the diffraction of the wave caused by the West breakwater and the measuring points for surge action

Solution 2 was an alternative should the entrance prove too narrow, increased width being provided by the shortening of the *E* breakwater. This solution was abandoned for fear of causing siltation in the port.

STABILITY EXPERIMENTS

Works destined to protect the interior of harbours from outside agitation have stability aspects which it is impossible to study by theoretical means alone. In publications where the question is studied (Beach Erosion Board, 1961; Reis de Carvalho and Vera-Cruz, 1962), reference is made to several formulae, the use and form of which, however, must be confirmed by experience. The following is one of the many formulae used to calculate the weight of blocks:

$$W = \frac{H^3 \gamma_r}{K_D (s_r - 1)^3 \cot \alpha}$$

where: W—weight of the blocks; H—height of the wave; γ_r—specific gravity weight of the blocks; γ_f—specific gravity weight of the water; $s_r = \gamma_r/\gamma_f$; α—angle of slope; K_D—coefficient depending on the nature of the blocks and the percentage of damage.

Thus experiments with scale-models arise from the necessity to confirm or correct, in practice, results obtained theoretically.

From the point of view of statistical analysis of the conditions of agitation of the sea a distinction must be made on whether there arises a problem of the stability of a breakwater, or of wave action in the interior of a harbour. While in the latter case there can be relatively little interest in a heavy storm which rarely occurs, the same is not the case with stability. In these cases it is necessary to establish a comparison between the high cost of a work, whose solidity needs only to be increased to resist rare storms, and the loss that would ensue if the work was ruined.

Stability studies with scale-models are normally made in two or three dimensions: in wave-channels (2 dimensions) to study the typical profile; in wave tanks (3 dimensions) to study the breakwater head.

The principle aims of stability studies of marine works with scale-models are:

(a) To study the stability of the outer and inner slopes of the proposed work to withstand the action of the typical waves prevailing in the prototype
(b) To determine the wave-characteristics that destroy the work
(c) To study overtopping, projections of water, etc., and the effects of recurved walls strategically placed on the parapets
(d) To study variations in profile, whilst observing the greatest economy in cost of work resulting from the reduction in the weight of the rubble mounds, increase of angle of slopes, etc.
(e) To improve the shape of the profiles and the heads when the initial project tested is found to be undesirable.

Geometric scales of 1/40 and 1/60 are frequently used in stability studies.

The stability of the outer slope or the head of a breakwater must be studied over tidal cycles because the action of the wave in those areas of the slope which are going to be attacked during varying levels of water, can provoke conditions of instability in the blocks, which would not obtain with a static level.

As regards the interior slope, its stability is conditioned by the existence of overtopping and projections of water and even by other factors which, obviously, also affect the stability of the outer slope, such as:

(a) The portion of the slope out of the water. A cushion of water can give considerable protection to a vulnerable internal slope
(b) Weight of the blocks
(c) Angle of slope
(d) Existence of untypical areas, creating discontinuity between different types of layers
(e) Crest-level of the breakwater
(f) Existence of curtain walls.

In the study of overtopping (which might prove necessary to determine the stability of the interior slopes or their influence on the increase of agitation inside) there can exist an accentuated scale effect (observed in publication (Saville, 1955)) which in the case of minor overtopping could cause the results of the model to be 25 per cent to 50 per cent more optimistic than the prototype, leading to a false idea of security.

Three dimensional tests, directed to the study of the stability of heads of breakwaters are necessary because the behaviour of the blocks can be noticeably different from that observed in the case of two dimensional tests. Whether we are considering natural blocks, concrete blocks, tetrapods, or other types, the elements localized at the front of the head are unsupported behind, as a consequence of which, the vulnerable zone tends to be localized a little towards the inside of the head, where the dissipation of energy is more violent and the blocks are less protected.

RESONANCE EXPERIMENTS

Long period waves (of the order of minutes) which occur in nature and which are normally designated as "seiches can so stimulate a mass of water in a harbour as to favour a concentration of energy and to create a stationary wave system. They are not potentially dangerous because of their vertical amplitude since this is only of the order of centimetres, but ships which are lying on the nodes, are subject to violent horizontal oscillations that can throw them against each other, break mooring lines, etc. Due to their enormous lengths, these waves propagate always in shallow water, their velocity of propagation C, therefore is given by Lagrange's well known formula:

$$C = \sqrt{gd}$$

where d = depth and g = acceleration of gravity.

In the case of a dock of rectangular plan, l being the greater side, open at one end, a resonance "of a quarter of the length of the wave" will be that in which an antinode is formed at the closed end and a node at the open end. The fundamental resonance period is given by:

$$T = \frac{4l}{\sqrt{gd}}$$

This period T can be a fundamental period or one of the harmonics of the period of "seiche".

Any process which tends to modify that form of oscillation proper to the basin, will, as a result, eliminate the resonance in those circumstances. One way consists in the modification of the depth d. Another can be constituted by the creation of structures that produce separations in the surface of the water, preventing it from resounding under normal conditions. Yet another can be connected with a more radical modification, in plan, of the shape of the basin, and with an alteration in the reflective power of the lateral walls.

As a harbour or a basin seldom has a perfect geometrical shape which permits an accurate mathematical calculation of the conditions of resonance, it is essential, even here, to resort to a scale-model study.

The scale-model study is carried out in a fashion analogous to a study in agitation, it being necessary to work with a generator which reproduces slow periods. The basin under study is submitted to the range of periods of resonance which occur (or which are suspected to occur) in the prototype and the interior agitation at various points is registered. From the values of the **index of shelter** (quotient of the inner wave height over the outer), the resonance periods are verified through the **response curves** (fig 5) and the disposition of the nodes and anti-

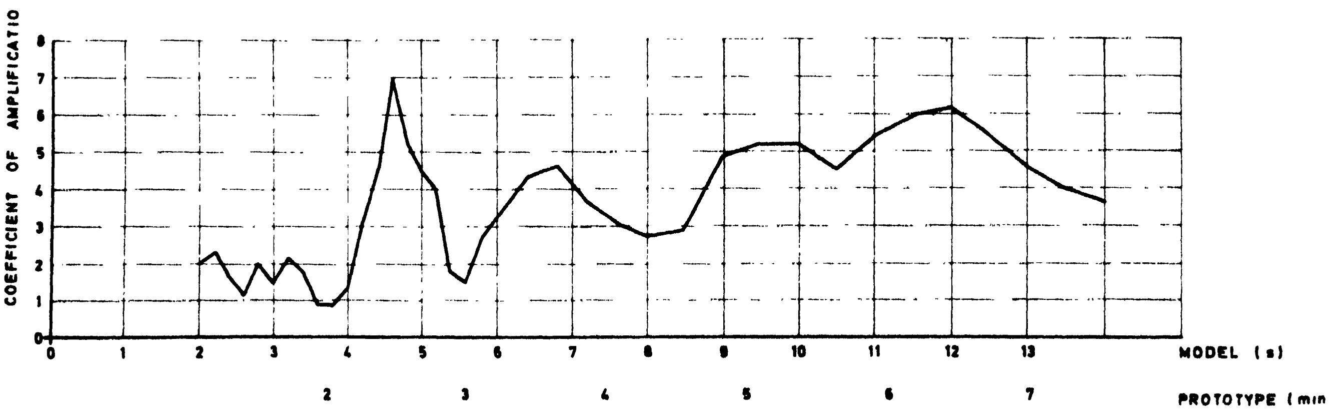

Fig 5. Harbour of Funchal. Response curve obtained through the resonance study

nodes are analysed in the plan and then the above-mentioned modifications are carried out as necessary.

The resonance models can, in general, be distorted, as the "seiches" are waves of great length that, as stated, are produced in relatively shallow water.

In the resonance experiments carried out at the LNEC in 1956 in connection with the port of Funchal, a horizontal scale of 1/500 and a vertical scale of 1/250 was adopted. In 1961 there followed a study of the conditions of resonance of No. 1 dock of the port of Luanda with a horizontal scale of 1/400 and a vertical scale of 1/200.

MOVABLE BED STUDIES

Most of the principle Portuguese harbours are situated in estuaries, lagoons or deltas: Viana do Castelo, Aveiro, Figueira da Foz, Lagos, Portimão, Lisboa, Faro, Olhão, and in Moçambique, Lourenço Marques, Beira, Cuama, etc.

As already stated, the study of these harbours can only be made in distorted scale-models with movable beds. The problems to which they are related, are invariably connected with obtaining the depths necessary for navigation.

While in the studies of the types previously described the similarity between prototype and model is relatively easy to achieve, leading to very tolerable results, the same cannot be said of studies with movable beds. The laws that govern the phenomena of sediment transport are complicated and still incompletely understood, similitude is difficult to obtain and the number of parameters exerting influence too high. Empirical processes have to be resorted to requiring calibration of the model once the vertical and horizontal scales are defined, the scale of tidal times stays fixed; then a calibration of their propagation is carried out (i.e., agreement is sought between the natural tide curves in different localities of the surroundings of the estuary or of the lagoon, with those of the model, through recordings taken at similar points. This concordance is obtained by increasing or decreasing the head losses in the flow.) Then a calibration of physiographic times is undertaken. For the purpose the adjustment of topographic profiles, obtained in different areas of nature, with the corresponding profiles of the model is sought. This adjustment is provided with the testing of different movable materials and of modifications in the characteristics of the incident waves (directions, periods, heights, duration of storms, etc.). By these processes it is possible to obtain immediately the definition of the scale of the physiographic times (ratio between the times, in the model and the prototype, which were necessary to obtain similar bed patterns).

In the model of Aveiro Lagoon (fig 6) now being studied at the LNEC, the utilization of the hydraulic power of the ebbing currents is being considered with a view to improving and maintaining the depths in the access channels to the Aveiro harbour, situated in the interior of the lagoon. The model will consider the reorganization of the course and section of the channels in the zone of access. It is intended, through these works, to reduce as much as possible the losses of energy that the defective lay-outs and inter-sections of the channels cause to the currents which, with each tide, flow and counterflow between the lagoon and the sea.

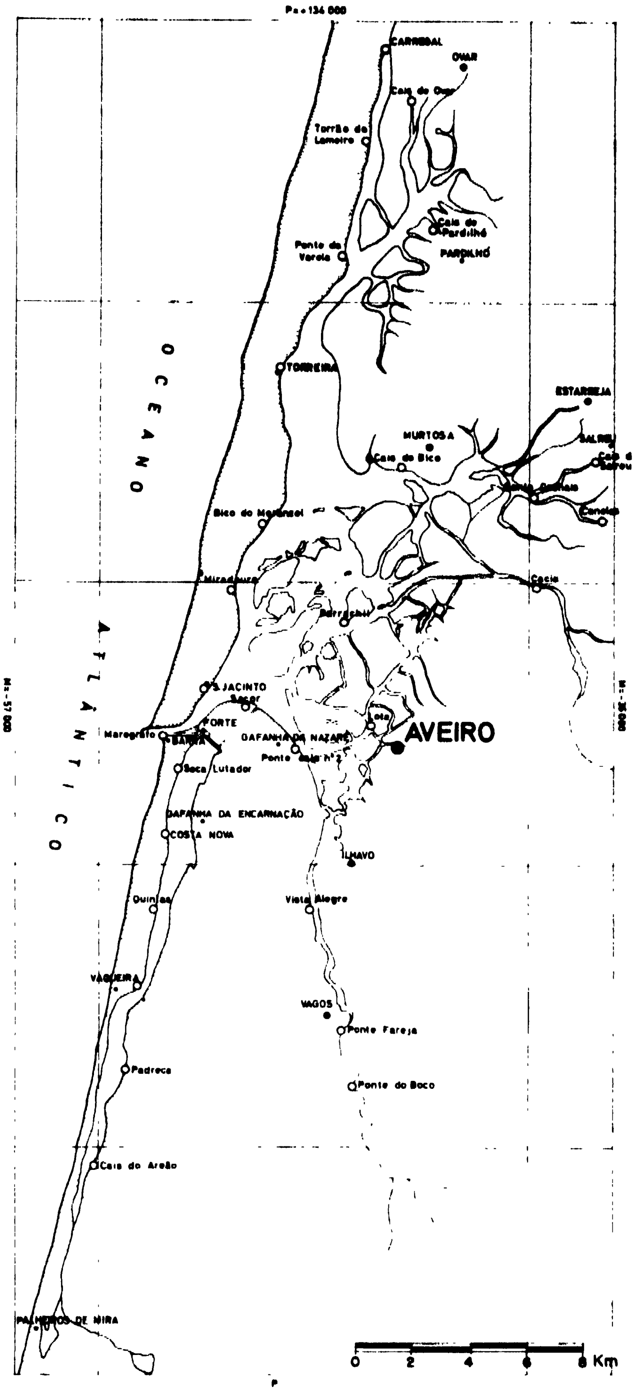

Fig 6. Aveiro lagoon

Another type of movable bed study undertaken by the LNEC was that of the harbour of Lobito (Angola). "The Lobito Spit" (fig 7) is an arrow of sand with a length of about 5 km (3.1 mi) and a width varying from 150 m (495 ft) to 250 m (825 ft) running from South West to North East. The model of the bay and of the spit of Lobito was constructed to the horizontal scale of 1:300 the vertical scale being fixed at 1:100. The purposes of the study were:

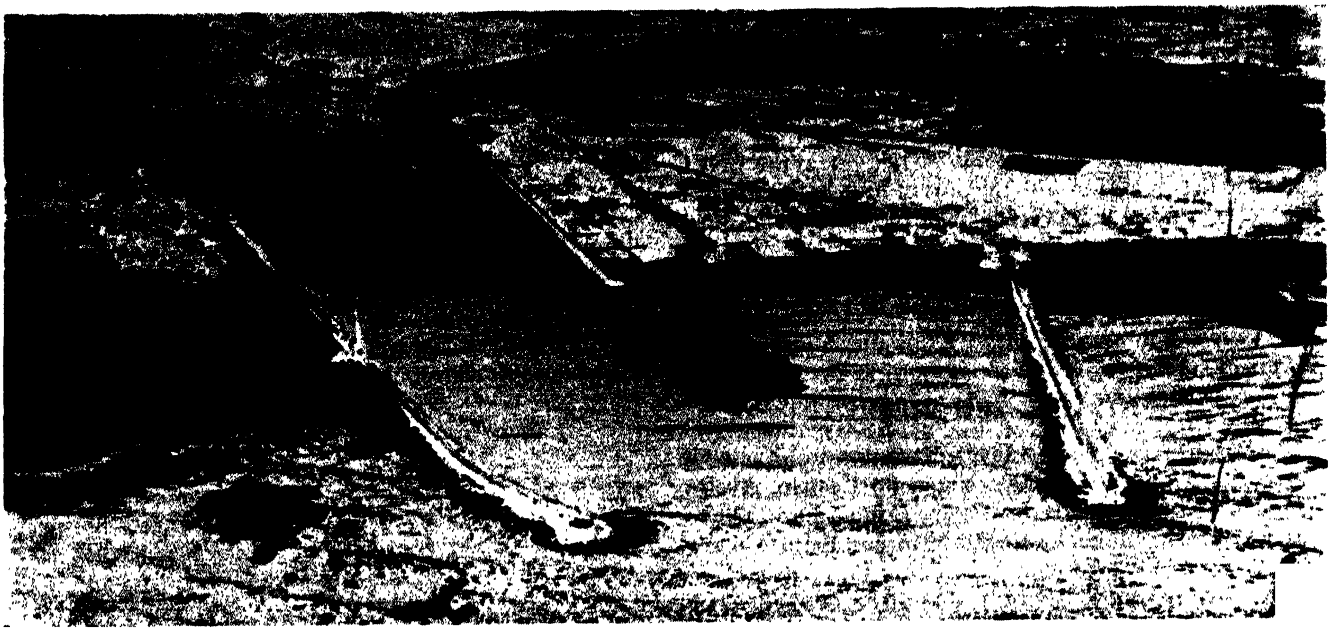

Fig 6a. Aveiro lagoon inlet

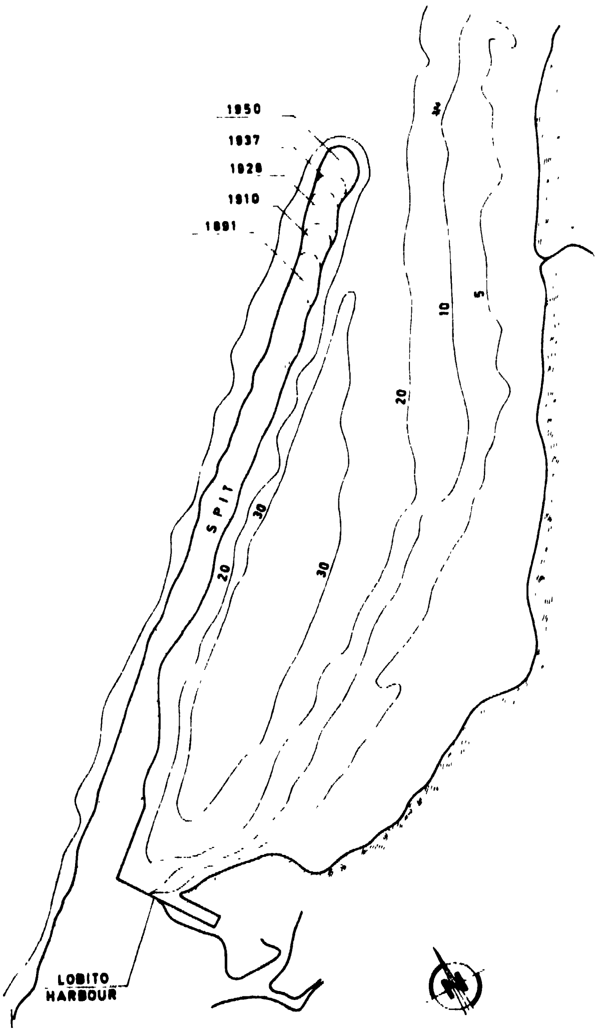

Fig 7. Harbour and spit at Lobito

(a) To verify if the spit, if left completely free to grow would eventually completely close the bay, or on the other hand if the tidal currents would be sufficient to keep the entrance to the bay open
(b) In the event of the total or partial closure of the bay, to find out what measures should be taken to prevent this occurrence
(c) To determine the behaviour of the spit should there be a lessening or stoppage of the flow of sediment coming from the south.

The result of the experiments showed that the tendency is for the spit to close and that to prevent its closing it would be necessary to build a system of groins to retain the silt.

CONCLUSIONS

The cost of an experiment with a scale-model is estimated, necessarily very roughly, at about 0.2 per cent of the cost of the work. The benefits derived from this expenditure are many and the investment is largely cancelled out. The following example may not be the most typical, but because it is recent, is most readily to hand: the stability study for the lengthening of the west breakwater of the harbour of Peniche as carried out in 1968 at the LNEC. It encompassed the two typical aspects for which a scale-model is an indispensable aid in the construction of a marine structure: the prevention of damage and the economy resulting from the suggestion of new solutions. The plan of the profile of the breakwater originally submitted for experiment (fig 8) had the following characteristics: the outer slope was stable enough for the maximum required wave; however, due to the strong overtopping which was observed, the stability of the inner slope was not up to standard. In view of these results a new profile was adopted (fig 9). This new profile admitted

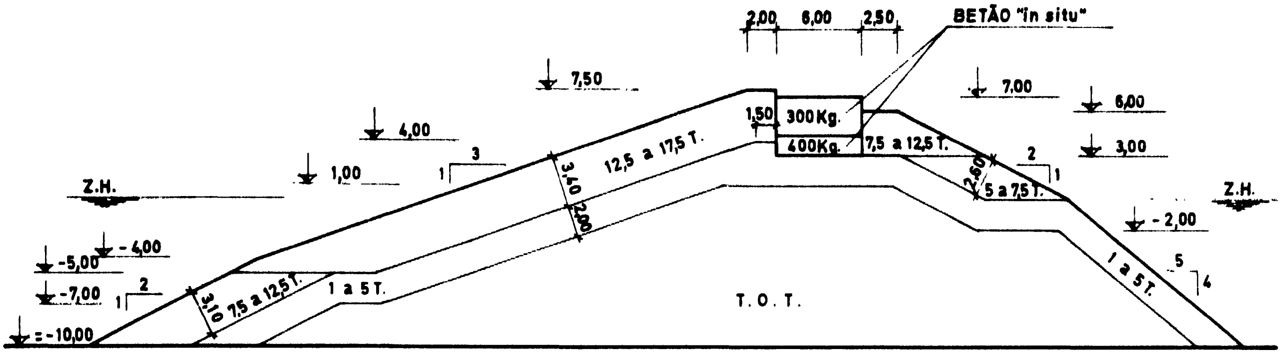

Fig 8. Typical profile of lengthening of West breakwater of harbour of Peniche—original scheme

a reduction in the weight of the rubble mound and an increase in the angle of the slope on the outer side of the breakwater, which brought about an economy in the cost of the work. A different arrangement of the inner slope and an alteration in the upper width and in the pervious nature of the breakwater solved the question of the damage originally noted in the model in that zone due to overtopping.

At other times studies with scale-models lead to conclusions which increase the original cost-estimate of a work, but they are necessary to prevent calamitous damage to structures. These studies have also lead to corrections to the outline plans of harbour basins, given indications as to the most suitable sites for dredging operations thus ensuring necessary depths for navigation, have initiated studies in erosion or silting-up, in resonances, in wave-reflection, etc.

Problems can thus be resolved in the laboratory, which if they were allowed to occur in nature, would be much more complex and could lead to costly remedial actions.

The recourse to an experimental laboratory is, therefore, a virtual necessity before the construction of a new port or the enlarging or replanning of an old one is attempted.

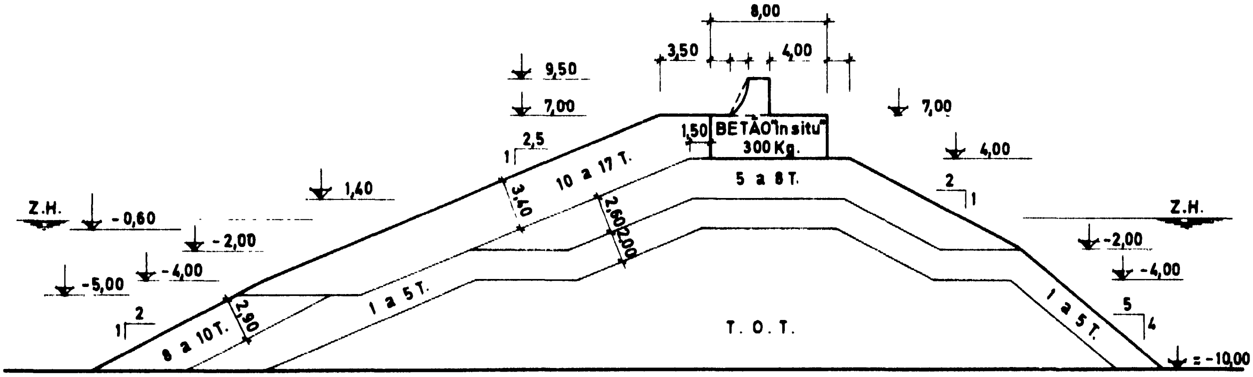

Fig 9. Typical profile of lengthening of West breakwater of harbour of Peniche—final scheme

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A Fishery Harbour at Madras, India
The Littoral Drift Problem and the Selection of Site

by T. Bhaskaran

Port de pêche de Madras, Inde. Problème de la dérive littorale et choix du site

On a choisi d'implanter à Madras, Inde, un port de pêche capable de recevoir en un premier temps 500 bateaux à moteur et 50 chalutiers.

Sur la côte orientale de l'Inde, la dérive littorale pose un grave problème pour ce qui est de l'entretien des chenaux d'accès. Elle provoque aussi la formation de bancs de sable dans les baies et estuaires naturels, où il faudra également procéder à des dragages périodiques. La nature et l'importance du problème de la dérive littorale ont été évaluées sur la base d'une étude du port de commerce existant.

Parmi les sites envisagés—estuaires de l'Adyar et du Cooum, crique d'Ennore, baie de Cassimode—les trois premiers ont été éliminés du fait de la formation de barres. Le choix s'est porté sur la baie de Cassimode, située sous le vent du port de commerce et dans la zone d'érosion du littoral, car elle requerra très peu de dragages d'entretien.

El puerto pesquero de Madras, India. El problema de la corriente litoral y la elección del emplazamiento

La ciudad de Madrás, India, han sido elegida para emplazar un puerto pesquero capaz de albergar en la primera fase 500 embarcaciones mecanizadas y 50 arrastreros.

La corriente litoral existente en la costa oriental de la India constituye un problema amenazador para el mantenimiento de los canales de acceso. Tiende también a formar barras de arena que exigirían dragados de conservación en las ensenadas naturales del mar y en los estuarios. Mediante un estudio del puerto comercial existente se ha determinado la naturaleza y magnitud del problema de la corriente litoral.

Entre los varios emplazamientos considerados, a saber, las desembocaduras de los ríos Adyar y Cooum, la ensenada de Ennore y la bahía de Cassimode, se han excluido los tres primeros a causa de la formación de barras de arena. La bahía de Cassimode, que se halla al abrigo del puerto comercial y en la zona de erosión de la costa, se elige automáticamente por sí misma ya que exige muy poco dragado de conservación.

MADRAS has been selected for the location of a fishery harbour on the Coromandel Coast, on the eastern seaboard of India, with modern facilities for processing, preservation and marketing, outfitting of boats, their maintenance and supplies of fuel and ice, etc.

While catamarans now predominate, mechanized deep sea fishing boats and trawlers will be introduced in stages. It estimated that during the next five to ten years 50 trawlers and 500 mechanized boats will operate from Madras, and will increase to 150 trawlers during the next 20 years. After about 40 to 45 years, 300 trawlers may be operating in addition to the 500 mechanized boats mentioned. A depth of 6 m (20 ft) for a maximum trawler draft of 18 ft is planned.

Site requirements

While Madras fulfils the requirements of proximity to fishing grounds, a potential fish market, abundant personnel engaged in the fishery trades, etc., the exact location of the fishery harbour from technical points of view depends on the features of the proposed harbour. Factors involved are:

(a) Its ability to provide safe access to boats in all weather

(b) The soil conditions at the site for location of breakwaters, quays, etc.

(c) The initial cost and the recurring cost of obtaining and maintaining necessary depths within reasonable limits.

The littoral drift problem is menacing and confronts any site on the east coast of India, and Madras is no exception.

The commercial port

The ready solution that would strike anybody would perhaps be: "Why not locate the fishery harbour in the existing commercial port itself?" Unfortunately the existing port has a comparatively small basin and a single approach channel in which the navigation of ships would be interfered with by the large number of fishing boats. Hence the fishery harbour has to be located outside the commercial port.

MARINE AND METEOROLOGICAL FEATURES

Madras Port, the third largest in India is located on latitude 13°-06′ North and longitude 80°-18′ East, about 608 km (380 mi) south of Visakhapatnam Port. Being located on the east coast, Madras is more influenced by the north-east monsoon (October to January when the rainfall of about 50 in mostly occurs). The south-west monsoon (February to September) induces some occasional

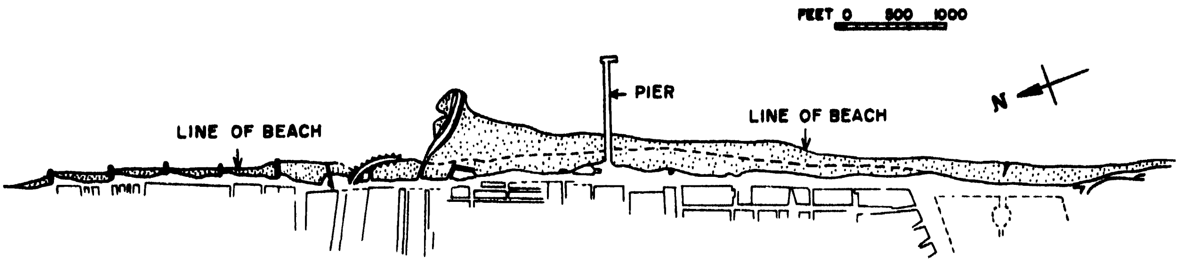

Fig 1. Madras Port Trust, India. Stages of construction, showing sand accretion in Madras Harbour. As it was in 1876

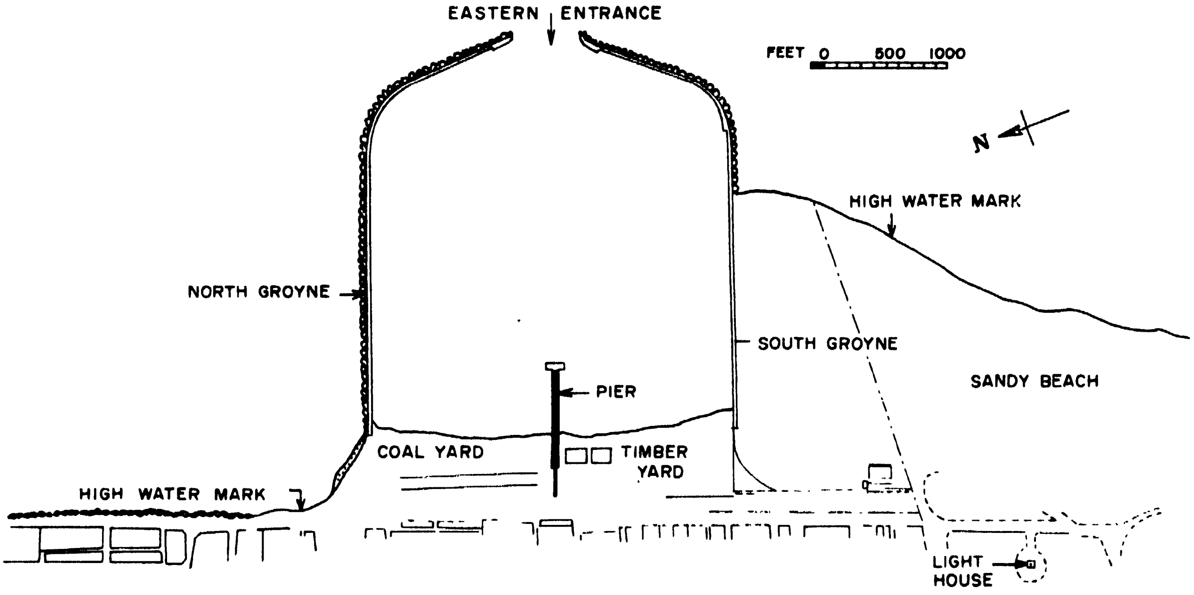

Fig 1a. Madras Harbour in 1900

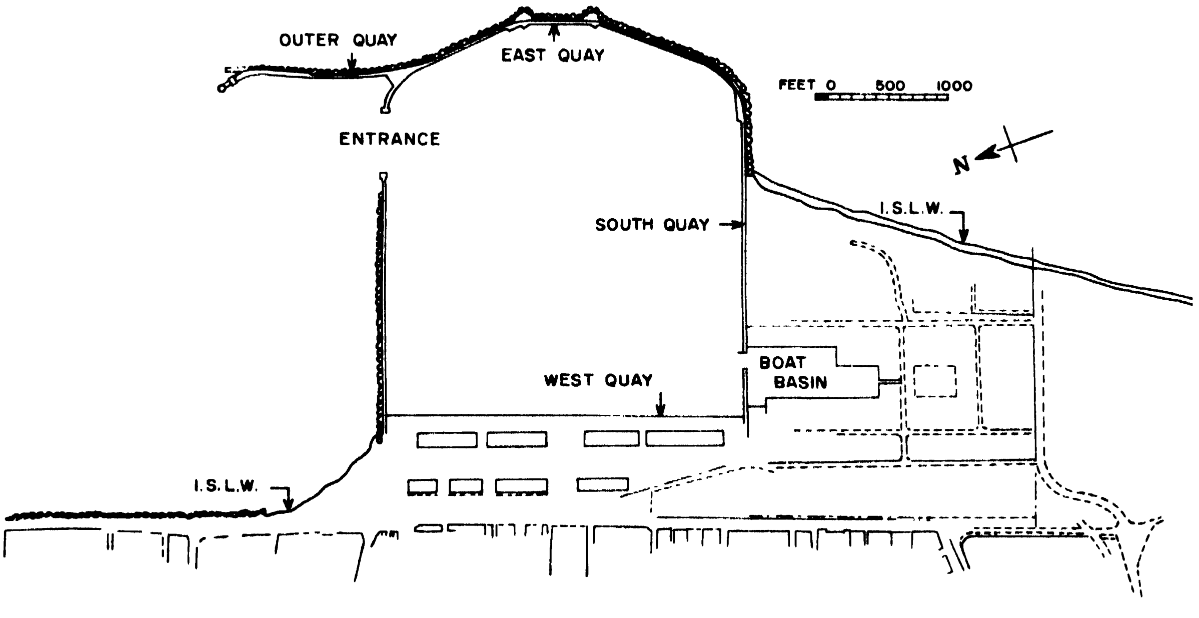

Fig 1b. Madras Harbour in 1920

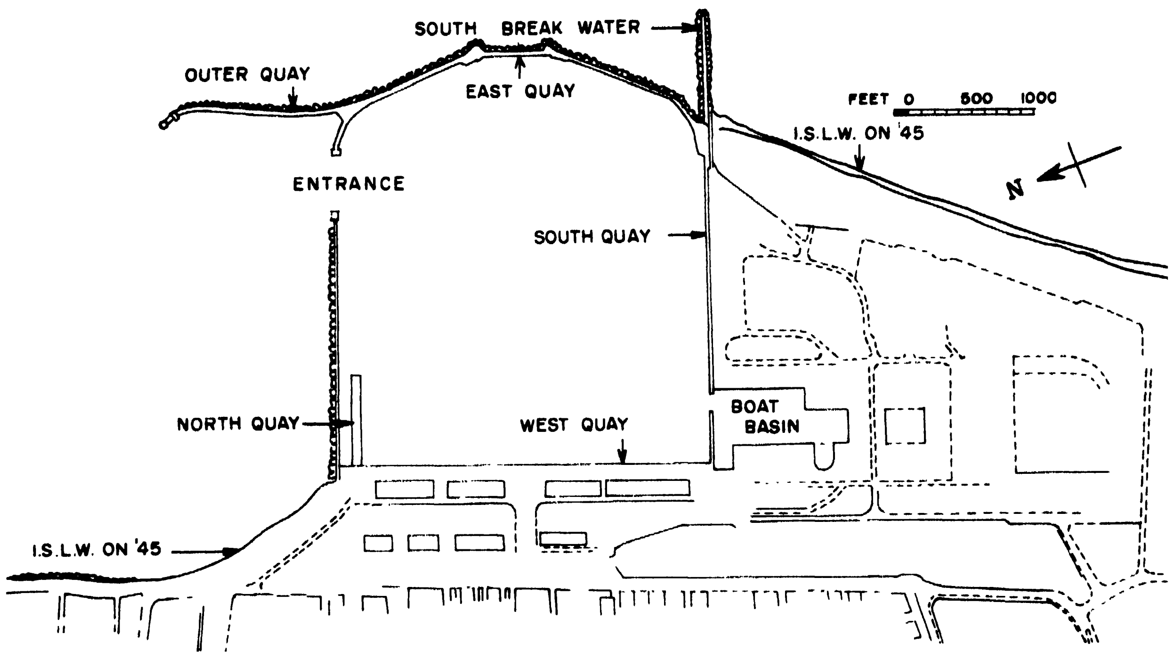

Fig 1c. Madras Harbour in 1945

squalls in April, May and June. The number of cyclones occurring in the Bay of Bengal varies from two to four per year of varying intensities depending on the centre and track of the cyclone, with consequent effect on the littoral drift movement.

During the cyclonic periods the sand drift is very great, and silting is aggravated. Entrance channels can be filled in or sand bars formed by silting -- both should be avoided in the selected site.

The tidal range is about (0.9 to 1.2 m (3 to 4 ft) at spring tides and between 0.3 to 0.6 m (1 to 2 ft) at neap tides. The surf off Madras breaks normally 91 to 122 m (300 to 400 ft) in fine weather from the beach line, and further off-shore, nearly 300 m (1,000 ft) away, during squally weather. With the wind off-shore, the surf is very often very high and breaks in the form of one heavy roller. At points a few miles north of Madras and Ennore (another site considered near Madras) the surf breaks one to two miles off-shore.

While the normal wave height at Madras ranges between 0 to 1.2 m (4 ft) waves higher than 1.8 m (6 ft) also occur for about 15 days in the year during the South-West monsoon season. During cyclones the waves are much higher. An average wave period of 8 to 14 sec occurs in all months. The current sets southward or northward depending on the monsoon, at a rate of 1 to 1½ knots, but is irregular and in between monsoons, the current is practically negligible.

The phenomenon of harbour ranging or "seiche" occurs at Madras Harbour, presumably on account of the geometricity of the harbour having its own well defined natural periods, causing a standing wave pattern resonant with the wave periods generated in the Bay. Model studies are being undertaken for the fishery harbour to choose a layout which would mitigate, if not altogether eliminate such an occurrence.

Madras Harbour is built on a very low and sandy coast exposed to heavy surf. The coast is mostly silty sand with fine to coarse sand predominating.

THE COMMERCIAL PORT

The history of the construction of the present commercial port of Madras is interesting and is intimately connected with the final selection of the site for a fishery harbour at Cassimode Bay (fig 2). Construction of the north pier of the present harbour was commenced in 1875 and the south pier was commenced two years later. As the work was carried out from the beach, the shore line also continuously shifted outwards into the sea as a result of sand accretion. The pier-heads were completed in 1881. By 1913 a triangular area of about 260 acres (105 ha) had accumulated on the southern side of the projection, with a base of 2,740 m (9,000 ft) along the coastline and a side of 600 m (2,000 ft) along the breakwater. A sandstrip along the shore had also formed extending from the port to south of the Adyar River mouth. Since then, this strip of sand has steadily increased. The Low Water Line had shifted at an average annual rate of 18m (56 ft) between the date of commencement of the harbour works in 1875 and 1898. The rate of advance had been reduced to 9 m (31 ft) per year during the period 1898 to 1921, and to 7 m (24 ft) annually between 1921 and 1950. The rate of advance of the Low Water Line is no clear indication of the quantity of sand movement for in the period before the harbour was built, the sand drift was estimated to be 240 thousand tons per year, but at the beginning of 1904 when the harbour was partially built, 550 thousand tons per year accumulation had been noticed.

At present the littoral drift is about a million tons per year on average. Presumably the sea bed on the south side

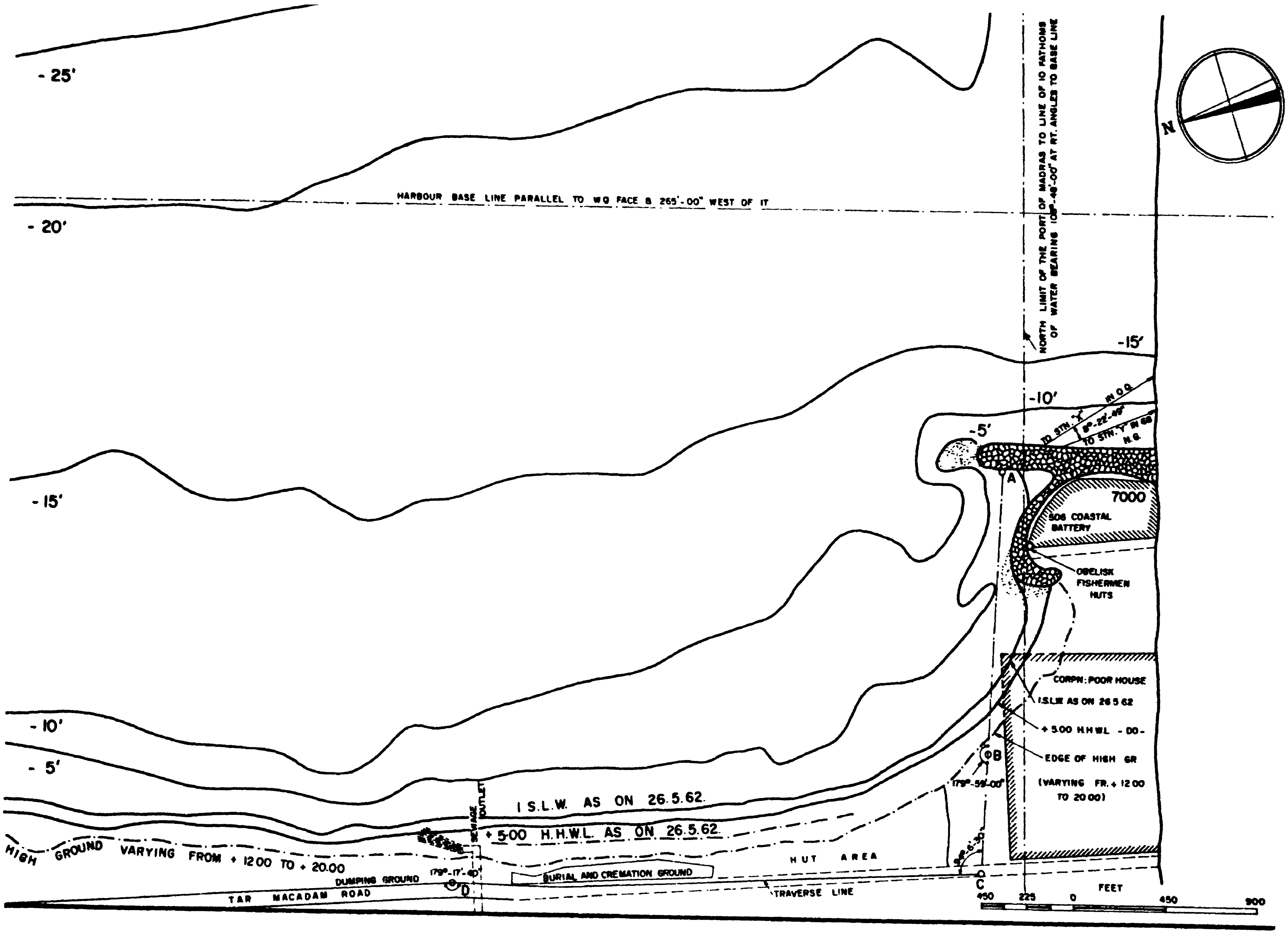

Fig 2. Madras Port Trust proposed fishery harbour site

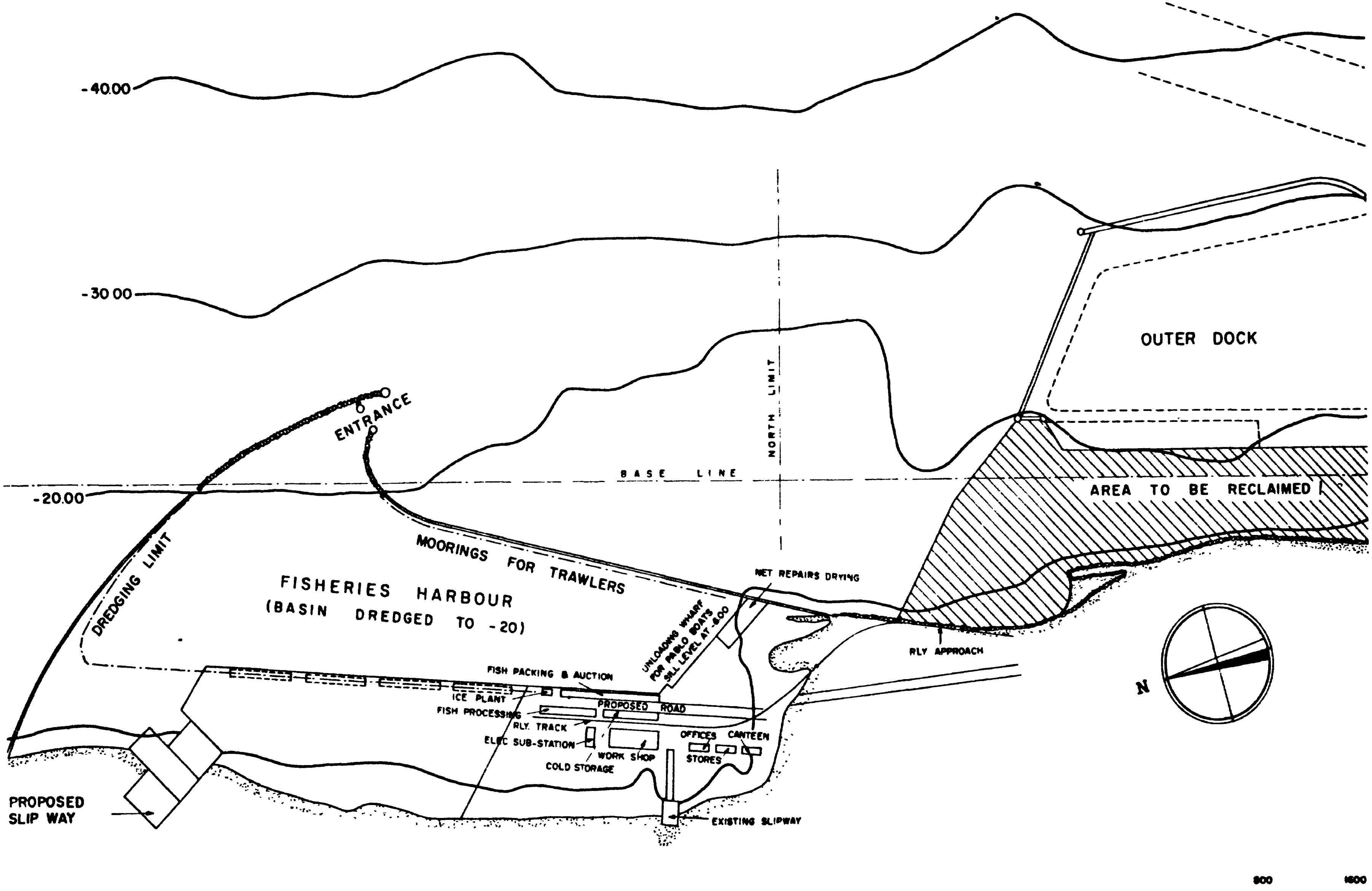

Fig 3. Madras Port Trust proposed fishery harbour at Cassimode Bay

has been slowly flattening out on account of accretion and causing more deposition annually in recent years.

No dredging of any kind was done outside the harbour till 1950. The littoral drifts of about 800,000 to 1,400,000 tons annually have been recorded around the harbour approaches and the adjoining areas since then, including the dredged area outside. The movement of the drift has been found to exist down to 13.6 m (45 ft). However since 1950, when a sand pump was installed on the "sand screen", the groyne extending sea-ward from the southern arm of the existing harbour, the accretion menace has at least been partly countered, as judged by the stabilization of the 1965 Low Water Line on the south side. There has also been a corresponding erosion north of the port for a distance of about 4.6 km (3 mi) along the shore. To check this, stone revetments were constructed along the shore from the Port end to Cassimode. However, beyond the revetment end in the north, a bay has been formed.

From the foregoing it will be clear that maintenance of a channel exposed to the drift siltation would be very prohibitive in recurring cost and the economics of a fishery harbour would not warrant such an outlay.

Sites considered

The city extends northwards along the coast for about 16 km (10 mi) from Adyar River mouth. Across the city the River Cooum, a sluggish river, flows 4 mi (6.4 km) north of the River Adyar, just south of Madras Harbour. The river mouth is perennially closed by a sand bar and though annually during monsoons, when there is heavy rainfall in its catchment area, the bar gets cut, it closes soon after. Cassimode Bay is about 2.4 km (1½ mi) north of the Harbour at the end of the stone revetment. Ennore is about 18 km (11 mi) north of Madras at the estuary of the River Kortalliyar which has formed a backwater on account of a sand bar at the mouth. The above are the possible sites at and near Madras City.

The mouths of Adyar, Cooum and Ennore rule themselves out from selection as a suitable site for a fishery harbour as the bar would require dredging constantly to allow free flow of sea water into the backwaters and sufficient depth for easy navigability. Maintenance of an artificial channel with the very heavy sand drift would prove enormously expensive.

Cassimode Bay, therefore, which is located on the erosion zone of the coast, and is in the lee of the present commercial harbour, automatically selects itself. The breakwaters for the fishery harbour would also prevent sea erosion of the beach along the bay and serve a double purpose (fig 3).

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Some Hydraulic Aspects of Fishing Port Siting

by J. G. H. R. Diephuis

Quelques aspects hydrauliques par rapport a l'etablissement d'un port de pêche

L'établissement d'un nouveau port de pêche ou l'extension d'un tel port ne doit pas être décidé par des experts de poisson et des projeteurs régionaux seulement. Le spécialiste de génie portuaire et côtier, dans sa qualité d'ingénieur conseil, peut contribuer essentiellement au succès du projet du port, combien modeste peut aussi être sa part dans le total.

L'importance de coopération est soulignée en vue de la coopération étroite et continue entre des spécialistes de différentes disciplines, ainsi qu'en vue du projet et de l'exécution d'investigations sur place et de recherches sur modèle réduits. Les deux derniers sujets sont traités plus en détails de manière à stimuler l'intérêt de toutes les autorités et à évoquer des discussions sur le sujet.

Algunos aspectos hidráulicos ensituar de puertos pesqueros

La situación de nuevos puertos pesqueros o de extensiones de puertos existentes no deberá fijarse por los expertos en el campo de la pesca o de la ordenación regional únicamente. Como ingeniero consultor el experto de ingeniería de costas, por modesta que sea su parte en la totalidad del trabajo, podrá contribuir esencialmente al éxito del proyecto.

También se subraya la importancia de colaboración, tanto en relación con una cooperación sólida y continua entre los especialistas en varias disciplinas como con la formulación y ejecución de investigaciones de campo y en modelos a escala reducida. De los últimos sujetos se trata más extensivamente a fin de excitar el interés de las autoridades concernientes y de provocar la discusión del asunto.

THE location of a fishing port is mainly affected by three factors, viz.:

(a) the supply of fish
(b) the market for fish
(c) the port proper, with its nautical, hydraulic, geomorphologic and civil engineering aspects.

As a hydraulic engineer the author leaves the first two items to biologists, ship designers, economists, regional planners and many other experts of various disciplines.

Item c is generally less striking to the imagination of the authorities. The design of the layout of a fishing port has to proceed hand in hand with site investigations and/or small-scale model studies. Time and trouble could be saved if a competent coastal engineering consultant was involved in a fishing port project from the very beginning. The services of an institution could be used, covering most fields and placed under one management to offer a more appropriate answer to this question than the composition of an ad hoc team of single experts from various origins.

Existing ports have sometimes been extended step by step, giving the designers the opportunity to learn from experience at great cost. But it is hard to plan substantial extensions or completely new sites without basic data, without thorough studies in the field as well as at the desk and in the laboratory, and particularly without the co-operation of planner, designer and coastal engineering consultant.

One main requirement of a port is that it should offer adequate shelter and protection against wave action. Vessels must be able to load and unload during severe weather conditions. No port can be designed to exclude all wave penetration. As long as vessels are able to enter, waves and swell can also enter, but their effect should be restricted and their energy exhausted or reduced.

A common misconception is to require that waves be reduced to a set dimension, say 0.5 metre. In most cases the waves inside a harbour are a fixed proportion of the waves outside, with the wave period as the only variable.

A second aspect of wave action is the stability of the breakwaters or harbour moles. Here, a certain risk has to be accepted, expressed as damage with a chance of occurrence of X per cent per annum. A chance of 5 per cent per annum is not equivalent to a chance of once in 20 years, as this is only an average over a long period. Moreover the expression once in 20 years induces people to think that the phenomenon is expected to happen only 20 years from now. In reality it means that it may happen any year, but with a chance of only 5 per cent.

The requirements for the stability of a breakwater are more severe than for the wave penetration inside the harbour but depend on many local factors.

Navigability

Although a supertanker is more difficult to manoeuvre than a fishing boat, even the latter needs a fair access, a conspicuous entrance and sufficient space to slow down and turn. As vessels can be affected by wind, currents and waves, these requirements impose pronounced criteria for the design.

Water depth

It goes without saying that the water depth on the access route and inside the port be enough for vessel movement. Possible shoaling of entrance and harbour basin should be checked. Removal is often a recurrent and costly affair, disliked equally by port authorities and ship's masters. As no two situations and conditions of port sites are equal, and apparently small variations in wave height, wave period and direction, geographic situation, river discharge, tide, current, wind, salinity of the water and sediment properties can have a very great influence upon the residual sediment transport, a thorough knowledge of the above phenomena is required.

Water level

Most sea ports experience water level variations due to tide or wind action. Movement restricted to high water level may be a nuisance, but the only possibility for an economic design. Ports with a bottom of soft mud situated in areas with large tidal ranges allow vessels to go aground during low water.

Sea bed characteristics

For the foundation of quays, buildings and breakwaters, the possibility of dredging, geologic investigation and soil penetration tests may be required. Not always will every method of investigation be applied. Frequently, the reliability of the data is more important than quantity.

Co-ordination

All efforts to obtain reliable basic data and to arrive at a harmonic design have to be thoroughly co-ordinated. Not only are careful time schedules, diagrams and network planning to be prepared but it should be borne in mind that collecting hydraulic and geo-morphologic data in the field is rather hazardous and not always suited for clear-cut scheduling. The author remembers a case where soil samples were not allowed out of a country for laboratory analysis as mud did not occur on the Customs Authority's list of export commodities. The procurement of suitable survey launches and workboats can also be a difficult exercise.

But even if all these difficulties are overcome, the nature of the investigations seldom allows for minute planning, as the course and the sequence of the observations and measurements is generally governed by the results of anteceding observations. With some goodwill and without misfortune, a price can usually be given for a fixed amount of work to be done, but inevitably this will require adjustment in the contract prices.

The most promising co-ordination and the best guarantee for continuity and efficient follow-up is the establishing of local, centrally organized research divisions. Whether they belong to a department of public works or to some other organization is not relevant.

In many countries, both developing and developed, such research divisions do not exist for hydraulic engineers. Reliable and co-ordinated data only can be a safe base for comprehensive coastal engineering designs, and to obtain these, the most obvious solution is the formation of hydraulics research groups.

Where such a local research division does not exist the project of a fishing port may be the motive to establish one. The author is well aware of the declining attitude of many planning commissions concerning such research divisions, who in their opinion only burden the annual budget, consume foreign exchange and have no direct economic benefit. There exists however an unmistakable indirect benefit of such institutions such as the avoidance of having to call on consultants for routine observations and collection of basic data. This may be underlined by a quotation of H. B. Sauermann, 1966, "Unusual events, most useful and important for model verification, often occur once a lifetime only. To observe and record these events is the task of local authorities since in most cases it would be impossible for a field unit to arrive in time".

A port design is not a self contained project. Although it is in itself a difficult problem, the solution implies the unnatural intervention in a natural dynamic equilibrium. The course or outflow of a river may have been interfered with, the littoral sediment transport interrupted and currents deviated. These phenomena may affect the coast line over a considerable distance and this asks for a centrally organized body with responsibility not only for the port proper but for a much wider area.

Recommended approach

The design of a fishing port, whether its future site is approximately known or not, asks for comprehensive investigations. On the hydraulic, hydrographic and civil engineering side the movements of the investigator should be from the large to the small—no detailed studies as long as the overall picture is still vague. As a first step the authorities concerned should seek the consulting services of reliable coastal engineering specialists. At that early stage a preliminary scheme for field investigations can be made. This will comprise the thorough study of all pertinent available data, such as aerial photographs, topographic and hydrographic charts, geological and meteorological reports, Admiralty and national sailing directions and the like. Generally a reconnaissance of the area including inspection trips on foot, by boat and by aeroplane or helicopter is required to restrict the areas to be investigated in more detail to a minimum. However, it should be borne in mind that a port located on a previously untouched coastline of an ocean or of an estuary is likely to affect a long length of coastline.

Long series of observations—of wave, wind, water level and current—are the basis of reliable forecasts, and these in turn are the basis of sound engineering designs. The shorter the observation period, the less effective the result and this involves greater risks and cost and greater ignorance coefficients (often wrongly called security factors). The co-operation of permanent local research divisions will be a necessary factor in determining the next steps in the investigation.

Having preliminary data available, the next step should be a more detailed investigation of one or more locations. Much attention should be paid to the phasing of these parts of the study. The programme may have to be often amended and controlled by the results of previous observations. This calls for immediate processing of the collected data and their evaluation. The responsible observer should be conversant with small scale hydraulic model testing as this is in most cases the next link of the chain.

Model studies are not always called for, but generally their use is recognized. Model techniques have far advanced, laboratories in many countries all over the world are modernized and well equipped and the cost of small scale studies are small compared with the cost of construction and maintenance of the projects. For example the saving of a few metres of breakwater could cover the cost of a model study. Moreover in a small scale model conditions and situations can be simulated which only rarely occur in nature but which could have a serious effect on the structure under examination.

FIELD INVESTIGATIONS

Purpose

The purpose of field investigations is twofold. The results may be used as the basis of the design, or they may be required for small-scale hydraulic model tests, for digital or analog computations or for further analyses or studies. Large engineering works can no longer be carried out merely based upon common sense and experience gained from other projects. The national interests in port construction and the amounts invested are so large that the utmost care must be taken to avoid failures. The less developed a country, the smaller its annual budget, the less it should permit itself the luxury of expensive failures. Therefore it is of great importance that designs aim at minimum recurring maintenance costs. Adequate site investigations being the basis of our knowledge of the decisive phenomena in nature and of our ability to make reliable forecasts, they are the most suitable method of producing satisfactory developments.

Duration and extent

The various subjects of study, which may range from topography, tides, currents, water properties, sediment characteristics, bottom configuration, water levels, waves, swell, and river discharges to meteorology, each has its own requirement. A single sounding survey may suffice in one place while repeated soundings are imperative in another. The influence of the water properties, e.g. chlorinity, upon the behaviour of colloidal clay—erosion, flocculation, sedimentation—is very great, and hence the discharge variability and estuarine circulation may be a main part of a study. Substantial seasonal fluctuations, e.g. the occurrence of monsoons, leads most investigations to be extended over a full year. This applies to wind, waves and swell, and it must be clear that occasional observation of these phenomena is not only deficient but may lead to wrong assumptions. Moreover as these phenomena do not only vary from one season to the other, but from one year to another, the observations may not even be restricted to one year but to a series of years. As the time available for studies and investigations, once the project has received the green light to go ahead, is generally inversely proportional to the time consumed by all parties concerned in arriving that far, the need of permanent local research divisions is evident and their assistance in all phases of the investigation invaluable.

Equipment

The equipment to be used may be divided in two groups. One group comprises very specialized advanced equipment for ephemeral use by specialist institutions or firms, such as equipment for deep offshore drilling, seismic surveying or aerial photography. Such equipment generally is rented or borrowed for a certain period and not retained. The other group comprises the equipment for more intensive use on routine or semi-routine basis. As a result the kind of the instruments and their use and usefulness should be at level with the skill and the number of the local technical staff, reliability under field conditions may also in general be a more important requirement than a high degree of accuracy.

Much attention must also be given to the processing of the data to be collected and the availability of trained personnel. Considering these items, the expected amount of data to be produced and the availability of survey launches and larger vessels to position and attend autonomous instruments, it can be decided whether visual observation has to be replaced by instrumental recording, graphical recording by analog or digital tape recording, cable connection by radiographic transmission. Needless to state that each decision has its particular financial consequences which have to be realistic.

Staff and organisation

Site observations can be made by permanent or ad hoc local organizations, by outside specialists, by consulting engineers own staff or by a combination of these. The direct responsibility for all the work must however be in one hand. Details of staff and organization vary too widely from case to case to be described here.

The requirement of immediate reduction of the observations and processing of data into conveniently arranged graphs, tables and charts, leads to the need for an adequate field-office staff of assistants, computers, draughtsmen and the like, in addition to the clerical staff, store keepers, car drivers, sailors and so on. In any extensive project, this calls for staff in the field to number from 40 to 100 men, of whom roughly 20 per cent are of professional grade, 30 per cent technical assistants and 50 per cent of unskilled or semi-skilled labour. Apart from these, a number of part-time workers may be employed, e.g. teachers in villages to observe rainfall water level gauges.

The advantages of keeping a plain system of files and archives, of cataloguing data and samples and of using standard size drawing paper and plain observation sheets is so obvious that they do not need to be stressed here.

Cost

The cost of a site investigation depends on the scope and the duration of the study, the country concerned and the experience and efficiency of the project engineer. Though the total cost may be high and run occasionally as high as half a million of US dollars—in most cases they range between twenty thousand for the small and less complicated investigations to two hundred thousand US dollars—it should be kept in mind that this amount is generally only a small percentage of the total project cost and as such fully justified.

Two final remarks in this connection. The first is that the available budget is often too small, not because the consultant pays excessive salaries to his employees, but because the original views on what had to be done considerably deviated from what was found by him to be necessary or because of the estimates being made unrealistic by inflationary tendencies.

MODEL STUDIES

Purpose

Small scale hydraulic models, together with analog and mathematic models, are an extremely useful tool to arrive at technically and economically justified designs of hydraulic structures. They have to be checked and calibrated from the results of site investigations and thus can never be a substitute of these. As model studies are performed to extrapolate existing situations or existing conditions—longer breakwaters, deeper channels, higher water levels, heavier wave attack—their accurate and minute calibration is of primary importance, and in the case of reproduction of shore processes this calibration or "tuning" of the model may occupy more than six months, often equal to or even more than the time required to carry out the actual tests.

Co-ordination with the investigators in the field on the one hand and with the designers on the other hand is imperative though not always recognized as such. The relation between site and laboratory study has been mentioned but the relation between model study and design should be just as close.

After about half a century of model testing in various countries and continents and after a rapid increase in the scientific and technical basis of these methods hardly anybody has now to be convinced of the necessity to have most hydraulics project preparations guided by model studies. This conviction may on occasion even go beyond the competence of model studies. Hydraulic engineers are no witch doctors and cannot procure a wanted solution which is not feasible. They only can assist in obtaining with scientific means technically and economically justified solutions of the problems posed by the project.

Wave penetration

Harbours are expected to offer adequate shelter to the vessels moored or anchored inside. Small-scale models are an adequate tool to study the reduction of incoming waves and swell of given period and direction of origin by a suitable layout of the harbour basins, by application of energy spilling beaches inside the port or by modifying width and shape of the entrance. Calculations often give a first indication, but as so many factors affect the final result, a hydraulic model generally provides the quickest and most reliable answer.

Models of this kind can be easily calibrated and do not require long periods for construction or test. They can be constructed with fixed beds and contours but not suited to the study of erosion or shoaling problems.

The time required for wave penetration studies is generally between three and twelve months. It is often useful, if laboratory space permits, to have a model standby after completion of the study to cope with unforeseen modifications and to enable the immediate checking of their effects.

Shoaling

A second category of models deals with shoaling, capital and recurrent dredging, erosion, sea defence and bank protection. They require movable bed conditions and hence are generally more complicated than the models described in the previous paragraph. The area to be investigated may be inside as well as outside the harbour entrance. Moreover the effect on the adjacent banks and beaches often has to be studied to avoid secondary difficulties and claims by third parties.

A model with a movable bed of fine sediments, with tidal currents, wave action and often river discharges needs more time for construction and particularly more time for calibration than a model for the study of wave penetration. When river discharge causes density differences the shoaling processes depend also on vertical estuarine circulation, which may require a model with salt and fresh water. The complete study may take between eight and twenty-four months. The length of this period need not discourage anyone as it is common practice to start construction of the model during the site investigations. In this way the actual delay is generally reduced to an acceptable minimum.

Breakwater stability

Most ports are protected by breakwaters or make use of groynes, jetties, moles, training walls and the like. The stability of these structures is determined by their type and shape, by the nature and the quality of the sub-soil and by the wave action and currents. Wave attack at known angles with the breakwater can in nearly all cases be calculated by means of established formulas. However where composite types are designed; artificial armour blocks of an uncommon shape are envisaged; where erosion of the sea floor or the estuary bottom due to the presence of fine sediments has to be prevented, a hydraulic model will be indispensable.

This kind of investigation extends to the study of forces on piles, of all kinds of maritime structures and of the stability of vessels and floating, submerged or fixed platforms. The time required for this kind of investigation may range in most cases from one to six months.

Organisation and cost

The hydraulic model studies and calculations described in this session will have to be made by specialized institutes. These are organized in the International Association for Hydraulic Research, who publish a journal and a biannual bulletin containing short descriptions of all activities of its members. The proceedings of these congresses are available for members and non-members alike.

Conferences on coastal engineering are also organized and co-sponsored by the US Council on Wave Research, every second year and alternating with the congresses of the IAHR. The proceedings of these congresses too contain a wealth of information on the subjects concerned. A third international organization to be mentioned in this respect is the Permanent International Association of Navigation Congresses, which has its seat in Brussels and its members are much concerned with hydraulic model investigation.

The costs of model investigations vary. They depend on the scope of the studies and on the nature of the phenomena to be investigated. They may vary from a few thousand US dollars up to half a million US dollars in the case of extremely large and complicated studies. As a rule, however, the cost of site investigations and hydraulic model studies together does not exceed a few per cents of the total construction cost and as such should be considered fully justified.

Several institutes of hydraulic research being non profit organizations have as an important item of their charter the dissemination of knowledge. As a result they will, in the case of projects for other (especially developing) countries either invite engineers of these countries to their institute to be present during the studies in order to gain experience and knowledge for themselves, or have the studies be carried out in the country concerned and send staff members to their country to assist their local colleagues and train them in the practice and theory of hydraulic research.

DISCUSSION

COASTAL DRIFT AND THE USES OF HYDRAULIC MODELS

O'Mealláin (Ireland—Chairman) said that this session dealt with highly technical matters of considerable importance. In view of the significance of the main subject matters in relation to the whole question of location, design and construction of fishing ports and the fact that there were only a few papers and these were of such a technical nature, it would be useful if the authors concerned, or participants speaking on their behalf, would devote a short time to introducing the papers.

Perhaps most useful of all would be accounts of experience with works carried out in accordance with designs resulting from model tests with a description and explanation of deviations of actual results from those obtained on models.

Van der Waard (Netherlands) introduced the paper on behalf of Diephuis of the Delft Hydraulic Laboratory and stressed the following points:

The necessity to consider the hydraulic aspects of the port right from the first conception of the project. It would surely be beneficial to both the users and the port authorities to provide not only good shelter and stable breakwaters but also to consider the aspect of shoaling, of maintenance dredging and the effect which the port would have upon the stability and the equilibrium of the whole area in which it was situated. Additionally, it had to be understood that the responsibility for coastal engineering advice, as for any other expert advice, rested with the consulting engineers who designed the port. Divided responsibilities often led to unpleasant interruptions. In the programme for any site investigations the scope of possible small-scale model studies should be discussed and terms of reference drawn up together with the coastal engineering experts. In this respect the need for close co-operation and co-ordination must be stressed. Not only had the field studies and possible model studies or calculations to be fitted into the time schedule drawn up for the project, but the experts of all different disciplines must co-ordinate their efforts.

Small-scale hydraulic model tests or calculations were not an interesting hobby of some institutes or universities but contributed substantially towards a technically feasible project. A variety of layouts could be investigated at comparatively low cost. Conditions only rarely occurring could be simulated to test the characteristics of a design or give the basic data for a design, thus avoiding failure. Model tests often contributed substantially towards keeping the annual recurrent maintenance costs (i.e. dredging and breakwater repairs) at an acceptable minimum. Knowledge of the natural phenomena at the site, of currents, waves, sediments, tides, soil, etc. was also essential. This knowledge, based on field studies, formed the only sound basis for a reliable model study as indeed of any marine design. The reliability and duration of the series of observations of basic data had, however, to be stressed. Short series might often be so misleading that it might have been better to do without them. The conditions during the different seasons often varied so much that a field study should comprise at least all seasons. In many cases one year's cycle often showed a great variety of conditions as compared with another, leading to the need in certain cases for continuous observation of certain phenomena over more than one year. Since this was generally not possible for all projects, the need of a local, permanent, centrally organized hydraulic research organization became evident in the major maritime countries, even in developing countries.

How Japan solved her problems

Seo (Japan) spoke on behalf of Sato. In Japan, which, due to its geographic position, was subject to a great variety of natural hazards including typhoons, the effects of wave movement, earthquakes and tidal waves were very important factors in preparing layouts for fishing ports. One of the methods generally practised in Japan was the hydraulic model experiment. Model experiments now being made covered such problems as waves, sand drift, port entrance and weak foundations, amongst many others.

Experiments were being made at the National Research Institute on Agriculture and Fisheries Engineering. A number of facilities had been built at these stations and a number of major fishing ports had been constructed applying the results of these experiments. The comparison of the actual results and the findings of these experiments had shown that they were most successful in simulating the actual conditions which had occurred after the structures had been completed. However, as was well known, there were severe restrictions to model experiments, one major factor was that the law of similitude was quite difficult to establish. One example was the experiments on sand drift, where the particle of drifting sand could not be made smaller as compared with the rates of miniaturization of the topographic conditions of the sea bed or the height, magnitude or frequency of waves.

To keep entrances clear

Hurst (Canada) reported that Canada had, over a period of time, under the auspices of the National Research Council, an Associate Committee studying waves and littoral transport. A number of smaller ports existed which were expensive to maintain because of the movement of materials into the harbour entrances. To try to solve this problem two solutions were suggested. One was an energy trap, i.e. a small basin with a channel going through it at the entrance to the harbour in which by some complicated process the energy of the waves is trapped resulting in a scour because of the currents forced out on the bottom of the channel. The second was the use of a submerged breakwater, which had originated with the results of a large breakwater constructed in Portugal; a surcharge of water inside the harbour was created by the action of the waves breaking over the breakwater and scoured it out. The energy trap had been constructed in Dingwall on the East coast of Canada, which was a small port, and so far the channel had maintained a fairly constant depth of about 12 feet. When sufficient statistics and data were available a technical report would be produced on the remedial works.

Scheiner (IBRD) commented that it was important for all marine structures to be properly studied. At times the investment on model tests was relatively high compared with the total cost of the works and they were therefore not carried out. This was a wrong approach; a study and preinvestigation could save much money and excessive repair and maintenance efforts later.

Littoral drift problem

Gucklan (FAO) said that apart from the technical aspects of model investigation, this discussion also covered the study of littoral drift. To descend somewhat in the scale of scientific conversation and illustrate a few of the problems to those present who were not engineers, so that it could be readily understood what the dimensions of the problems were really like; he would refer to Bhaskaran's paper about Madras. In this paper a very clear statement of the difficulties encountered by the Port of Madras had been presented since its construction in the 1870's. Since 1910 there had been several detailed scientific papers prepared and read at meetings of the Institution of Civil Engineers in London concerning the coastal sand travel at Madras harbour by its engineer, Sir Francis Spring and his successor H. G. Mitchell and others so that there was quite a lot of information available for study.

A few sentences were read from the introduction to Sir Francis Spring's 1913 paper ("The Proceedings, Institution of Civil Engineers (IASTCE)", April 1913), which were pertinent to the questions being asked today. To put the statement in its correct perspective, when this paper was prepared, engineers were only beginning to be aware of the difficulty that existed which appeared to be a sand drift estimated at about 100,000 tons per year. This value had been obtained by following the changes in the contours by means of frequent hydrographic surveys. In fact they were not able to apply any of the scientific equipment now available to Russell, Diephuis and the others to indicate more accurately the total quantities of sand moving:

> Reference was made to the important engineering problems arising out of the movement of sand along the south-east coast of India, a movement which threatens to overhwhelm Madras harbour sooner or later unless adequate measures be taken to meet and counteract it. Reference to other papers will show that the subject of the causes of this accretion as well as of its past effect and of its probable future effect on the artificial harbour has already attracted some attention. The broad facts are... *probably to the joy of the real estate agent*... that a triangular area of sand about 260 acres in extent has formed since the harbour was begun in 1877. The base of this triangle is about 9,000 ft extending southwards from the south breakwater of the north of the river Couum and with a side along the breakwater of about 2,000 ft. But this is not the whole of the accretion for south of the mouth of the Couum and as far as the Adyar river about 114 acres more have been accreted in a more or less parallel strip all along the shore; simultaneously with the formation of this 374 acres of accretion there has been a corresponding erosion of the shore for a length of more than 3 miles of the Coromandel coast to the prevailing winds etc. . . .

That was the problem in 1913. Since then the volume or acreage of naturally reclaimed land had perhaps increased several times over. On this land many of the commercial port establishments have been sited, and further south since 1945, a number of fishery villages have been founded. The maintenance of the water depth of Madras Port therefore presented very serious difficulty. It had now been determined that about a million tons of sand had to be physically removed to maintain the required depth and either dumped at sea or on the coastline north of the port for nourishment purposes.

Apart from Madras, all along the east coast of India the problem of coastal drift was immense. Reliable figures were available to indicate that there was a drift, at the commercial major ports of Vizakapatnan and that recently constructed at Paradeep in Orissa, of approximately 1,500,000 to 2,000,000 tons per annum, moving over a period of about nine months in a northerly direction.

An FAO report on a proposed fishery harbour at Lomé in Togo (Report No. 1569), indicated that the movement of sand in a westerly direction was of the order of 2 million tons per annum. The construction of the Lomé commercial port had recently commenced. The sand beach was originally perhaps 150 m wide. When seen some months ago that section to the west of the breakwater had grown to perhaps more than 300 m wide above high tide level, apart from the considerable shoaling below low tide level as far seawards as the extremity of the main breakwater.

Manta, in Ecuador, was in a similar position, though to a lesser degree, and many other ports with similar problems could be quoted.

Portugal used hydraulic models

Cardoso (Portugal) explained, in the absence of the author of the paper on the study of harbours by hydraulic models (prepared by the National Laboratory of Civil Engineering at Lisbon), that the Portuguese west coast was characterized by strong wave action, much silting caused by its many rivers and an important current generally running southwards but in some cases having returning branches near the shore. The south coast was generally quieter but was open to violent storms from the South West and South East.

In the 1930's Portugal carried out a programme of harbour renewal and improvement but with limited model work. In some cases problems had been encountered. A new programme of harbour improvement was again being carried out. This time, however, extensive hydraulic model work had been done with great success.

Pérez Bellod (Spain) said that it had been made clear that the financial resources available to developing countries were always very limited and project costs had to be reduced to the minimum. It was also known that all model studies, besides the technical difficulties involved, were basically rather costly. A most interesting approach to securing lower costs would be to have formulae which would enable work to proceed in the laboratory by graphic methods which would give a first approximation of the studies needed for the building of new fishing ports, the location of these and the extension of existing ones. There was no doubt that there were already studies which had been undertaken that enabled such approximations to be obtained.

It was not intended to attack the use of models in laboratories. They, too, were important, being concerned with port design techniques, and their results were most useful but the value of mathematical studies which would reduce the period of time and cost of port model studies should be borne in mind.

Lopez Gutierrez (Mexico) referring to Russell's statement, said that it would be important to know whether model studies had been undertaken concerning the influence of suspension material in relation to the stability of the tidal inlets and coastal lagoons; also, whether the relationship of wave action and littoral drift to the problem of maintaining open entrance to these lagoons had been examined.

How models saved money

Russell (UK) agreed that model experiments were relatively expensive, yet their cost, being typically less than one per cent of the cost of the port, was fully justified. Such experiments might well prevent a defective or unsafe port being built involving heavy loss in damage or annual maintenance. All established hydraulic laboratories were able to use the various analytical and digital methods of calculation that could substitute for hydraulic models. Generally, however, the analytical methods required an unacceptable degree of simplification of the stated problem, while the digital methods required some but rather less simplification. Digital models were not always cheaper than hydraulic models.

Replying to Lopez Gutierrez's enquiry, Russell said that the topography of a sandy river entrance and its modification as a result of building civil engineering works could be reproduced well in a mobile-bed model. All the velocities, those of the tidal currents and of the wave-motion and the geometric size, and the bed-material had to be correctly chosen. The scale by which one multiplied sedimentation in the model to determine sedimentation in nature could be obtained either by tracer studies conducted in model or prototype or by extensive experience in the use of the same scales.

Heyer (Federal Republic of Germany) stated that he was responsible for the design of the harbour of Lomé, and would therefore like to give some details on its siltation. Before starting construction, some measurements were made followed by model tests. During the preliminary investigations it was found that the West African coast around Togo was subject to constant changes. Changes in the sea bottom of up to two to three metres occurred with the construction of the breakwater and the main jetty, and the transport of sand along the coastal area which was interrupted by the structure amounted to 1,500,000 cu m per year. The siltation within the four-year period of construction and the coastal shift of the sea amounted to 250 m. The erosion (the windward erosion on the eastern side, amounts to a length of 6 km and has a depth land side of 70 m) would have been greater only that a lower layer of very compact soil, a lime sandstone, existed as a barrier.

The success of Tema

Dalman (UK) referred to Loewy's (Session II), paper stressing the advantages that had been gained by the use of hydraulic models for Tema fishing harbour. Fortunately, littoral drift was not of prime concern for, although the rate of drift on parts of the Ghana coast were very substantial, this was not the case at Tema which was one of the main reasons for siting the new commercial port there.

A large three-dimensional fixed-bed model of the main and inner fishing harbour breakwaters was used to determine the optimum layouts. The client wanted the entrance facing southwards but model tests demonstrated that quite inadequate protection would be achieved and that wave action at the entrance would be intolerable. The entrance was built facing eastwards and the arrangement had proved to be quite satisfactory. The same model showed that some overtopping of breakwaters might take place and design crest levels were therefore appropriately raised.

Tests on a two-dimensional model enabled comparatively simple breakwater cross-sections to be devised. These tests led to economical designs both by the evolution of optimum cross sections and also because loss of material during placing could be minimized.

The two fishing harbours had been completed for several years and the degree of protection afforded could be described as excellent. Waves at the entrance to the outer harbour were often over 4 feet high and waves of 8 feet were not uncommon. The maximum height predicted by the model within the outer harbour in these conditions was 1 foot 6 inches and had been 1 foot 3 inches in the prototype.

The success of the model experiments for Tema had clearly demonstrated their great value. In the paper by de Campos Moraes the cost of models was estimated as 0.2 per cent of the cost of construction works. For the three-dimensional model of the outer fishing harbour at Tema the cost was about 0.6 per cent of the work.

Lomeli Delgado (Mexico) said that in the case of Mexico the difficulty was one of convincing the authorities of the advantages of this type of laboratory investigation.

Varied answers for different problems

Cox (UK) wished to emphasize the problems of siting a fishing harbour on a cost subject to major littoral drift because they were different to those involved in siting a large commercial port.

Guckian had drawn attention to the littoral drift problem at Madras and other ports of the east coast of India where major installations were provided for by passing the drift material across the entrance channels.

At Madras there was an experimental shore-based dredger which had worked well for many years. The full-scale plan proposed had not yet been installed, probably for reasons of capital cost.

At Vizakapatnam there was an offshore breakwater and the design allowed for a floating dredger to work behind this to remove the accreting material.

Paradeep had a full-scale shore-based dredging plant and also a floating dredger.

No fishing industry could stand the cost of providing this type of expensive dredging and no government was likely to subsidize a fishing port by providing such equipment. Therefore, if a fishing port was needed in such an area it must be adjacent to a major commercial port. Where there was a coastal inlet with a large tidal compartment there should be no difficulty in maintaining an entrance having sufficient depth for relatively shallow-draft fishing vessels. Model tests could be of great use in locating breakwaters or other training works in such a way as to reduce the work required to maintain the bar at a suitable depth.

On the open coast, where neither of the above two conditions applied, then the only economic method of developing the fishery was to improve beach landing facilities as proposed by Russell, and others in the previous session.

SESSION V

The Fish Harbour at Gothenburg

by S. Axelson

Le Port de pêche de Göteborg

L'auteur expose les facteurs intervenus dans le choix du site du port de pêche de Göteborg, qui joue un rôle très important dans l'industrie halieutique de la côte ouest de la Suède. Il décrit l'agencement des installations portuaires et traite de l'administration et de l'organisation du marché, ainsi que du système de vente et des dispositions touchant celle-ci.

Après avoir cité des statistiques témoignant de l'importance du port, l'auteur étudie diverses propositions qui visent à améliorer tant l'organisation et la gestion du port que ses moyens techniques.

El puerto pesquero de Göteborg

El autor describe en este estudio los elementos que sirvieron de orientación para elegir el emplazamiento del puerto pesquero de Göteborg, puerto que desempeña una función muy importante en la industria pesquera de la costa occidental de Suecia. A continuación describe la disposición de las instalaciones y servicios portuarios y examina la administración y organización del mercado. Se describen también el sistema de subastas y las instalaciones del mercado.

La importancia del puerto se revela en las estadísticas; se consideran las propuestas hechas para mejorar la organización y ordenación del puerto y sus instalaciones técnicas.

WHEN built, in 1910, the fish harbour of Gothenburg was the westernmost part of the commercial port. At that time it was regarded as the best possible location. The harbour was easy to reach both for the fishing vessels and for the customers. Transhipment was facilitated by the laying out of streets and railway lines in the immediate vicinity. Nor was it any hindrance to traffic in the commercial port, as this was concentrated east of the fish harbour.

After the construction of new quays, sheds, and warehouses, to the west of the fish harbour in the 1930's, the fish harbour became a slight nuisance, especially as the port area on the southern river bank was a rather narrow one and gave very little space for traffic routes. Subsequently, an investigation was made on the advisability of building a new fish harbour further out on the river mouth.

However, it was decided not to move the fish harbour for various reasons:

Building a new fish harbour was calculated to be very expensive, far more expensive than could be justified by reductions attainable in costs of handling and transport.

Formerly a great exporter of herring to countries behind the iron curtain, Sweden now exports very little, since these countries have big fishing fleets of their own. The remaining European market of any importance is West Germany. The shortest transport route from the North Sea and the Skagerrak fishing places to West Germany goes by Jutland, and that is the reason why the Swedish North Sea trawlers now land their herring catches at Skagen and Hirtshals instead of Gothenburg. In consequence they also benefit by a considerable extension of active fishing time.

The commercial port of Gothenburg is constantly moving westwards, concentrating on the north banks of the river, as, for instance, the Scandia harbour for container and roll-on/roll-off traffic, and the Tor harbour with its jetty soon capable of receiving oil tankers of 200,000 dw tons.

Layout plan

The layout of the fish harbour and its location in the commercial port complex are shown in figs 1 and 2.

The total area of the fish harbour shore facilities can be divided into the following principal parts:

open auction halls	5,200 m^2	(6,200 yd^2)
depot for containers etc.	4,000 m^2	(4,800 yd^2)
packing rooms (to let)	3,400 m^2	(4,100 yd^2)
offices, accommodations etc.	3,600 m^2	(4,300 yd^2)
Total	16,200 m^2	(19,400 yd^2)

The quay length totals 1,160 m (1,276 yd). It is possible to berth about 50 fishing vessels at the same time. There are 500 m (545 yd) of quay (8 m (26 ft) wide) available for the discharging of 17 to 18 motor trawlers simultaneously.

General port characteristics

The water depth is 5 m (16.5 ft). The tide is insignificant.

The main buildings are of wood and brick. The girders of the roofs over the auction halls are of steel. All decks and floors in the halls and packing rooms are made of reinforced concrete and coated with asphalt. The quays consist of timber decking on timber piles.

There are 44 packing rooms let to private fish dealers. These rooms are in close connection with the auction halls. The private fish dealers also rent office premises along with the packing rooms. There is also a bank office available.

Cold storage space is provided by many of the wholesalers in their packing rooms.

Outside the fish harbour there are two privately owned ice factories. There are also two refrigeration and cold storage companies

Recreation rooms, shower baths, washing and drying rooms are available to the harbour employees. The fishermen spend very little time in the harbour and there is little demand from them for amenities.

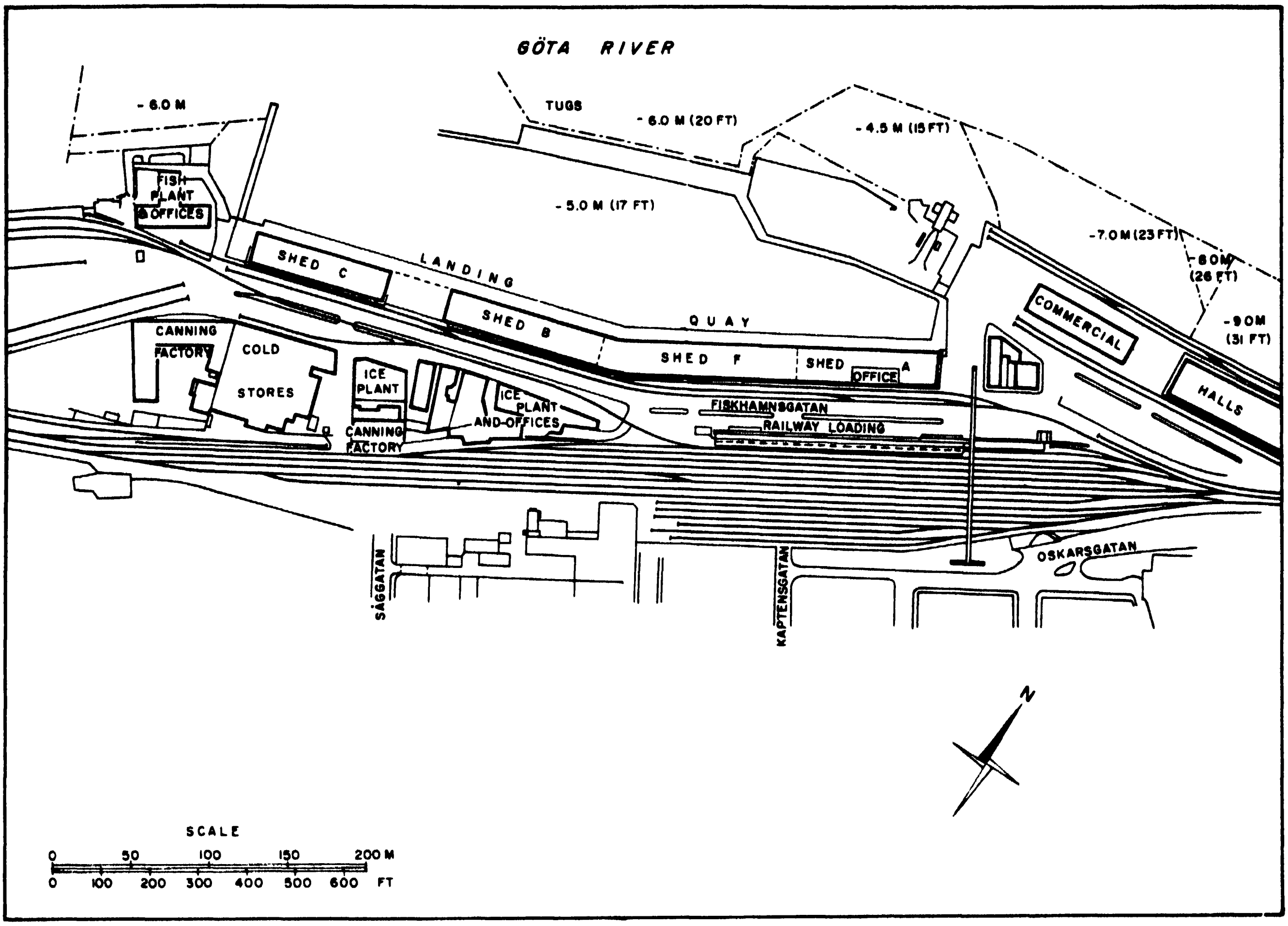

Fig 1. Fish terminal at Gothenburg

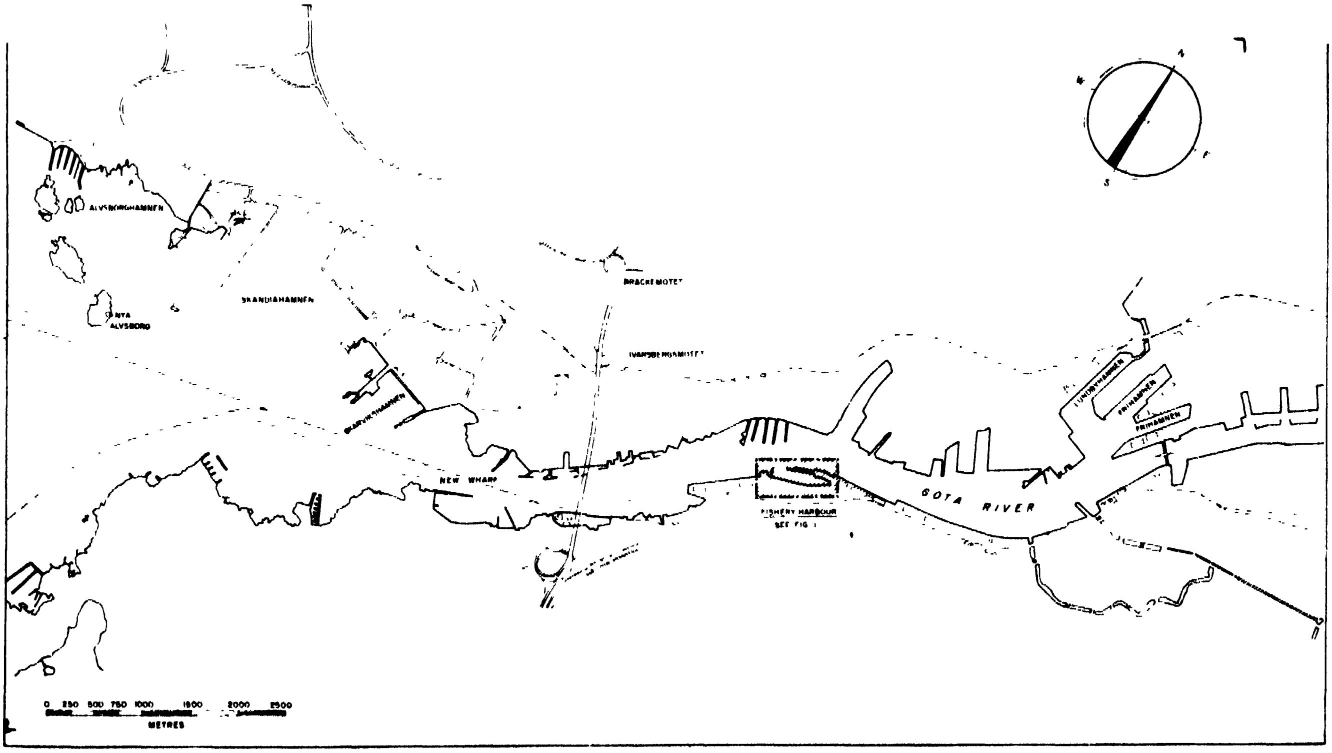

Fig 2. Port of Gothenburg, Sweden

Traffic flow

As may be seen from fig 1, there is a roadway between the fish harbour and the railway terminal (for goods trains only). There is some through-traffic on this road but it is lessening because of the new city highways. Nevertheless, it sometimes delays traffic to and from the fish harbour.

Retailers from Gothenburg and its neighbourhood transport their fish from the harbour by their own pick-up trucks or lorries. The wholesalers deliver their fish to a large extent by rail. Every weekday two trains leave the railway terminal for the Gothenburg main railway station. From there, trains leave for all parts of Sweden. Small quantities are still being sent by rail to Western Germany and to Belgium, France and Italy.

ADMINISTRATION MACHINERY

The fish harbour is owned by the city of Gothenburg and administered by the Gothenburg Harbour Board. According to special regulations, the Gothenburg Harbour Board has the sole authority to organize and carry through public auctions of all fish landed within the area of the fish harbour. The regulations are duly authorized by the county administration of Göteborgs and Bohus Län.

The quality of the fish is controlled by officials of the municipal sanitary authority. Fish not suitable for human consumption is confiscated.

The office and auction staff number 20. For other routine work and outdoor work in the halls and on the quays there are another 20 men, e.g. foremen, truck-drivers, hall workers, and watchmen, in permanent employ. There are about 30 temporary hands daily engaged in discharging cargoes.

At sea the fish is packed in boxes, together with ice. Three types of wooden boxes are used, with capacities of about 45, 30 and 20 kg. The fishermen supply their own boxes, buying them from special merchants. The buyer in the auction takes over the boxes together with the fish, at a price of two-thirds of the price paid by the fisherman. Only fresh boxes are in use, i.e. the buyer cannot return the box.

As soon as the fishing boats arrive, the seller must report on special forms and declare the catches for sale. These reports are listed in proper turns and the fish quantities will be sold accordingly in the halls.

Unloading begins on all weekdays at 05:00, or sometimes earlier if larger lots of fish are reported for sale. The crews of the fishing vessels unload the fish boxes onto the quay, where hall workers place them on specially constructed pallets and thence transport them by fork-lift trucks to the auction halls. Eleven fork-lift trucks belonging to the fish harbour are used.

Weighing and sizing

Herring, sprat and mackerel are sold by the case, while most other species of fish are weighed in the harbour and sold by the kilogram. Weighing of the boxes of fish is carried out by the hall workers, and representatives of the fishermen's organization control the sizes of different species of fish. Labels showing species and sizes are placed in the fish boxes.

Auction

The public auctions being on Mondays, Wednesdays, Thursdays and Saturdays at 07:00, on Tuesdays and Fridays at 07:30. Just before the beginning of the auctions the buyers are informed by loudspeaker about the number of auctions, place of sale for different assortments, and any other important details. As a rule, as many as eight or nine auctions may go on at the same time on the following system:

one auction for shellfish and smaller packages
two auctions for mackerel
two auctions for herring and sprat
three or four auctions for other species

Generally, the auctions last for two or three hours or more, until all fish is sold. In seasons with large catches of herring there may be several sales later in the day. If necessary, there are also evening auctions. Auctions are carried out by employees of the fish harbour office, one auctioneer being engaged in each auction, assisted by a hall worker. The latter points with a stick at the various assortments about to be sold and puts labels with the buyer's names on the booked boxes.

The ascending system is practised. The fish is knocked down to the highest bid. The auctioneer must, however, before knocking be sure that no other buyer will make a bid. The auctioneer himself is not allowed to bid or to make anybody bid for him at the auction, nor is he allowed to be the owner or partner of any fishing trade or of any firm processing or canning fish. As soon as an auctioneer sells a catch of fish, he notes such items as the seller's ship number, type of fish, quantities, name of buyer and prices. Then these reports go to the office for some additional coding, and thereafter to the Data Service Bureau for data processing of invoices and seller's specifications. The auctioneer himself is responsible for his sale. During the course of the auction the auctioneer takes charge of the fishermen's interest by making sure that minimum and guarantee prices are observed according to regulations. In order to avoid as far as possible complaints referring to quality, quantity, price etc., each auctioneer has to check his reports after the auction.

The seller is entitled to take back the announced lot before knockdown. Fish taken back this way cannot be sold again before a new notification has taken place. The buyers must remove their purchases from the auction places for delivery to warehouses and shops. Anyone may buy without any special licence.

Port administration's commission

The commission charged to the seller is 5 per cent on herring and sprat and 6 per cent on other species of fish. On salted herring or salted and dried fish, the fee is 2 per cent. These percentages include auction charges, discharging, transport by fork-lift trucks from the quay to the place of sales in the halls, weighing and all expenses for administration.

The charge for fresh water for fishing boats is S.cr. 0.02 on every fish box sold.

To protect the fish harbour against losses, the buyer is obliged to deposit in the fish harbour office a banker's guarantee, a bank book or some bonds for a sufficient sum if he does not wish to pay in cash.

MARKET ORGANIZATION

A system of minimum and guarantee prices is in operation for the more important species of fish. The prices are fixed by the National Commission of Agriculture (Statens Jordbruksnämnd) after consulting the fishermen's organization. If it proves impossible for a fisherman to sell his catch by auction at a minimum price, this surplus will be purchased by a co-operative undertaking subordinate to the National Commission of Agriculture, the Västkustfisk Co-operative. The surplus catches taken over are utilized in a number of ways. Part is processed for the inland market, the rest, principally herring, is exported both as fresh and as processed. The less valuable types of fish are used for fish meal.

The price system is financed by fees on all sea fish landed in Sweden, as well as on all imported sea fish, as far as the fish is sold at a price not lower than the minimum price.

Beside the minimum prices fixed by the National Commission of Agriculture, there are private minimum prices fixed by the fishermen's organization without a special price guarantee. It is of limited importance.

Recently, a governmental committee, the Government Commission on Fish Prices (Fiskprisutredningen) put before the Secretary of Agriculture a proposal that a new price regulating organization covering the entire Swedish coast should be set up. In this new organization there should be represented not only the Government (by the National Commission of Agriculture) and the fishermen, but also industry and commerce. It is also proposed to form a new equalization fund for market fluctuations along with the economic support of marketing activities. The financing of these new measures is intended to be based on fees levied on landed or imported sea fish.

Average prices of first rate species of fish are quoted daily. These quotations are broadcast (about noon) at Radio Sweden's local station of Gothenburg and also published in the morning newspapers.

Statistical details regarding quantities and sales are worked out and completed monthly. Specifications are handed over to authorities and to associations in different branches of the fishery.

Fishermen working on the west coast of Sweden are members of the Swedish West Coast Fishermen's Federation (Svenska Västkustfiskarnas Centralförbund or SVC). This organization is the first genuine association of fishermen in Sweden and was started in 1930. SVC consists of fifty local branches covering the area from the Norwegian frontier to the province of Scania (Skäne) with a total membership of about 4,500, including boat owners and crew. The organization assists its members in the solution of all the problems, both technical and financial, which can affect either fishing co-operatives or independent fishermen. The SVC also acts as a link between the fishermen and the various authorities.

The principal executive organ of the Federation is the Congress, which is held annually (about 170 representatives from the local organizations). The delegates discuss matters suggested by the executive.

In addition to providing current information of use to the fishermen a fortnightly magazine is published by the SVC. Fishermen are charged 2 per cent of the gross landings as a fee by the SVC and to give the fishermen the largest possible support, the SVC has invested money in several branch associations. The fishermen of the Swedish west coast are well known for handling their catches with great care, giving a very high quality to the fish sold.

BUYERS AND THEIR ASSOCIATIONS

The following buyers use the facilities of the fishing port of Gothenburg:

40 wholesalers	Fiskgrossisternas Förening, Gothenburg. (Fish Wholesalers' Association)
300 retailers (stationary shops)	Göteborgs Fiskhandlareförening, Gothenburg. (Gothenburg Fish Retailers' Association)
80 fishmongers (mobile shops)	Göteborgs Fiskmanglareförening, Gothenburg. (Gothenburg Fish Vendors' Association)
20 canning factories	Svenska Konservfabrikernas Riksförening, Lysekil. (Swedish Canners' Association)
10 curing firms	Sveriges Saltsillförening, Gothenburg. (Sweden's Salted Herring Association)
1 curing firm	Storsjöfiskarnas Försäljningsförening, Lysekil. (Deep Sea Fishermen's Sales Association; handling mostly only long-line caught, cured ling)

There are no statistics available of buyer's annual turnover, nor an indication of their relative importance in the market.

STATISTICAL DATA

There are more than 300 motorized steel and wooden trawlers employed in deep-sea fishing in the North Sea, the Skagerrak and the Kattegat, which land their catches in the Gothenburg fishing port. A coastal fishing fleet consists of about 100 small wooden vessels.

Most of the vessels have their home ports somewhere in the archipelago outside Gothenburg or along the coast. These vessels (registration mark GG) on 31 December 1967 consisted of:

Steel vessels: 75

registered length: 24 to 36 m (80 to 120 ft)
gross tonnage: 85 to 348, total 10,994
horsepower: 400 to 1,100, total 53,890

Wooden vessels: 247

registered length: 18 to 32 m (60 to 105 ft)
gross tonnage: 40 to 168, total 20,913
horse power: 120 to 1,000, total 104,455

Coastal fishing vessels: 197

registered length: 7.5 to 15 m (25 to 50 ft)
gross tonnage: 15 or 35, total 2,294
horse power: 5 to 120, total 3,960

The steel and wooden trawlers have completely modern equipment and use electronic equipment both for navigation and finding fish.

Unlike many other countries, the vessels are not owned by shipowners or companies ashore, but by the fishermen themselves. Their crews consist of six to eight men, and the most usual thing is for three or four of the crew to be joint owners. All of them have exactly the same share of the fish. The net proceeds from the catch are divided up into a number of shares, the actual number being variable. On a fishing vessel carrying a crew of six, the income may, for example, be divided up as follows: out of the gross proceeds, joint operation costs, such as fuel, oil, cotton, waste, fish boxes, ice and some stores etc., are met. The net catch is then divided up into eleven equal shares, of which one each goes to crew members and the remaining five towards the cost of the vessel and its equipment.

More than 80 per cent of all fish is caught by trawl. Other kinds of gear are seine, purse seine, drift nets, anchored nets, and lines.

Main species of fish caught are herring, mackerel, cod, haddock, coal-fish, whiting, plaice and pollack. There is a great variety of fish available and about 50 species of fish are landed.

Beside vessels registered at the district of Gothenburg, a considerable number of vessels from the rest of the west coast land in Gothenburg; also a small number of foreign vessels from Denmark and Western Germany.

FURTHER DEVELOPMENT

In co-operation with a governmental committee led by Mr. Carl Lindskog, the following recommendations are made.

The fish harbour should be administered by the fishermen, the wholesalers and the retailers, being the parties directly interested in the efficiency of the handling and selling of fish. The fish harbour of Gothenburg is not a local harbour for the import of fish to the Gothenburg region but a central port for the Swedish West Coast fishery as a whole. Nevertheless, the City of Gothenburg takes a great interest in the fish harbour because (a) the main part of the fish consumed in the region is bought at auctions in the fish harbour, (b) many businessmen of Gothenburg make their living from the fishery industry and fish distribution and (c) many fishermen are citizens of Gothenburg.

The fish harbour should be run by a company or an association set up by the fishermen, the fish wholesalers and retailers and the City of Gothenburg—each party owning a third of the shares. To avoid conflicts, the new organization should have a neutral president, e.g. appointed by the County Administration. As the fish harbour activity is a business of food supply, the City should be represented by the Board of Marketing instead of the Harbour Board. The new organization should rent the fish harbour with its buildings from the owner, the Port of Gothenburg.

The new organization should carry out the following improvements to facilitate effective operation:

TABLE 1. NUMBER OF TRIPS, QUANTITIES AND VALUE OF LANDINGS IN 1967

Month	*Number of trips*		*Total*	*Quantities (metric tons)*	*Value (Sw. cr. 1,000)*	*(US$ 1,000)*
	By motor trawlers	*By other suppliers*				
January	1,237	62	1,299	1,894	2,090	(411)
February	1,448	76	1,524	1,943	2,166	(393)
March	1,042	75	1,117	1,363	2,009	(382)
April	1,124	100	1,224	3,107	2,809	(537)
May	1,088	92	1,180	2,988	3,109	(593)
June	1,401	138	1,539	1,529	2,917	(552)
July	963	150	1,113	1,582	2,088	(397)
August	1,561	140	1,701	3,168	3,531	(637)
September	1,632	159	1,791	2,937	3,374	(621)
October	1,211	115	1,326	2,407	2,883	(551)
November	1,447	103	1,550	2,568	2,517	(481)
December	871	51	922	1,466	1,399	(268)
Total	15,025	1,261	16,286	27,952	30,892	(5,884)

TABLE 2. QUANTITIES AND VALUE OF LANDINGS BY SPECIES IN 1967

	Quantities (metric tons)	*Value (Sw. cr. 1,000)*	*(US$ 1,000)*
Herring	5,987	3,271	(612)
Sprat	275	387	(73)
Freshwater fish	7	21	(4)
Imported fish	1,137	2,399	(460)
For fishmeal and fodder	1,950	506	(97)
Other species of saltwater fish	18,601	24,308	(4,638)
Yearly turnover	27,952	30,892	(5,884)

Repair the buildings, especially the roofs and floors of the auction halls.

The roadway between the fish harbour and the railway terminal should be moved south to a position outside the fish harbour area to make space for lorry traffic. The area within the harbour to be repaired to facilitate fork-lift truck traffic.

The loading of railway wagons should take place exclusively from the loading quay north of the railway terminal. The tracks along the fish harbour buildings may then be removed and the area used for car and lorry traffic.

A car parking area for 150 to 200 cars should be laid out.

The whole area of the fish harbour must be fenced in.

A new auction building for about 200 customers should be erected for the conduct of modern auctions. A Dutch auction clock, or more than one if required should be installed. The clock should be in direct connection with a computer for the production of invoices, statements, statistics, etc. The auction in Gothenburg should also sell fish on behalf of fishermen landing their catches at any other landing places along the West coast of Sweden.

A plain hall for herring is to be erected between the B and C halls (see fig 1).

The cost of all the work to be carried out as above is estimated at about S.cr. 2.5 million.

Karachi Fish Harbour

by M. R. Qureshi

Le port de pêche de Karachi

L'auteur expose les motifs qui ont incité le Gouvernement pakistanais, sur les conseils de l'Organisation pour l'alimentation et l'agriculture, à créer un port de pêche à Karachi. Il présente les critères suivis pour le choix du site et fournit des détails sur l'agencement du port et de ses installations annexes.

L'auteur décrit les méthodes actuelles de débarquement et de manipulation des produits de la pêche, et suggère plusieurs améliorations possibles. Le port est géré par la Karachi Fishermen's Co-operative Society Limited, assistée par les pouvoirs publics. Après avoir exposè les fonctions de la coopérative, l'auteur conclut en mentionnant les travaux qui doivent encore être menés à terme pour que ce port de pêche moderne soit doté de toutes les installations dont il a besoin.

El puerto pesquero de Karachi

En este estudio el autor describe las razones que indujeron al Gobierno de Paquistán a construir un puerto pesquero en Karachi, siguiendo el consejo de la Organización para la Agricultura y la Alimentación. El autor indica los criterios que se han seguido al elegir el emplazamiento y da detalles de la disposición del puerto y de sus instalaciones y servicios.

Describe el autor los procedimientos actuales en el desembarque y manipulación del pescado y sugiere algunas mejoras. Describe igualmente la administración del puerto por la Cooperativa de Pescadores de Karachi Sociedad Limitada con ayuda del Gobierno. Expone las funciones de la Cooperativa y, por último, indica algunos trabajos que hay que acabar todavía para que este moderno puerto pesquero sea completo en lo que se refiere a toda clase de instalaciones y servicios.

THE present site was the alternative selected by FAO. The first choice was not available as the Karachi Port Trust, under their future development plans, had reserved it for the construction of oil berths and an oil basin. This was proposed after Mr A. Van den Berg and Mr H. Van Pel (FAO Experts) had prepared their report.

Reasons for selection of the site were:

(a) It was about 3½ miles from the entrance of Karachi Port
(b) It was situated on a creek very near to West Wharf, and there was an earlier proposal by the late British Indian Government to construct a small fish terminal at this site
(c) It was connected to the existing land and no extensive road works were needed. Electricity and water were also available
(d) By deepening the creek, and constructing a jetty and other installations, it was possible to arrange the landing of fish easily
(e) Its nearness to a big village of fishermen with a population of 15,000 and easy access to the retail markets, Karachi Port and the railway station

DETAILS OF LAYOUT AND SHORE FACILITIES

Land on the south-east side was first reclaimed and allowed to settle down for some time.

Installations on the water front are:

(a) Two pumps for supplying oil to the boats and also two hydrants near them for supplying drinking water
(b) An ice plant capable of producing 30 tons of block ice, and 8 to 10 tons of flake ice every 12 hours. Also three cold rooms for holding ice blocks and fish, each of 45 tons capacity
(c) A double-storey building containing the wholesale fish market, rooms for customs, market staff and auctioneers. In front, rooms have been provided for two banks and a post office. A room is reserved for the storage of nylon, manila and coir ropes, and other miscellaneous articles. On the first floor is situated the office of the Fishermen's Co-operative Society which manages the auctions, the distribution of fish, and supplies the requirements of fishermen
(d) The frontage of the jetty is 408 m (1,340 ft), situated on a dredged channel of 122 m (400 ft) width and 4.25 m (14 ft) deep at low tide. A 122 m (400 ft) jetty is provided on the south-east side for mooring the boats when they are preparing for sea. A boat basin 122 m by 168 m (400 ft by 550 ft) has been provided for mooring boats alongside the navigational channel. A 229 m (750 ft) jetty is being used for mooring the boats on the south-eastern side, adjacent to the wholesale fish market
(e) Other shore facilities are:
    (i) A cafe for meals
    (ii) A store-room-cum-office for staff of the stores of the Society
    (iii) One shed for storing salt and part utilized by a private workshop for repairs and overhauling engines
    (iv) One shed 30 m by 12 m (100 ft by 40 ft) contains a store-room for nylon twine and two ration shops
    (v) Two sheds for the auction of salted and dried fish (each 30 m by 12 m (100 ft by 40 ft)
    (vi) Ten rooms for the residence of supervisors engaged in managing the wholesale fish

market. The ground floor is used as a dispensary for a doctor and his staff. They attend to minor cases and out-patients. One building is the residence of the Manager and two smaller residential quarters are for two officers of the Society

(vii) Land has been allocated for fish-processing industries. At present there are ten freezing plants, two fish canning, two fish dehydration plants and one for shark liver oil. All fish freezing plants but two are in operation

(viii) Besides the above, buildings have been provided for the Marine Fisheries Department and, temporarily, for the Zoological Survey of Pakistan. The total developed area on the south-east side (the main fish harbour) is 119,131 m² (1,387,500 ft²)

(ix) Water is supplied to all from an overhead tower of 9,100 l (2,000 gallons) capacity, fed by an underground tank of 227,000 l (50,000 gallons) supplied from the city main. Since there is a shortage of water, another connection has been taken from the mains of the Karachi Port Trust but is not yet in use. The main roads within the fish harbour are 18 m (60 ft) wide and the side ones are 12 m (40 ft) wide.

EXISTING AND PROPOSED HANDLING FACILITIES

At present the facilities provided are:

For landing fish, jib cranes were provided but not used. Fish is landed in small baskets by manual labour, or, if the fish are large they are simply thrown from the boats to the jetty. This arrangement is very unsatisfactory and some simple device, such as gantries, may be introduced.

After landing, fish is thrown on the floor—also not hygienic and requires improvement.

For carrying fish from the jetty to the auction hall small trollies are used which are incapable of landing the total landings.

Fish is carried from the auction hall to vehicles by small trollies or in baskets.

Some sorting tables are provided but these too are not fully used.

The proposed improvements are:

That gantries be provided for unloading the baskets directly on to the trollies which should be of larger size, and the fish should not be allowed to touch the floor.

If it is necessary to spread out the fish, movable platforms covered with galvanised sheets and supported on cement blocks should be provided in the bays throughout the auction hall, and from there transported on trollies to the vehicles outside the hall.

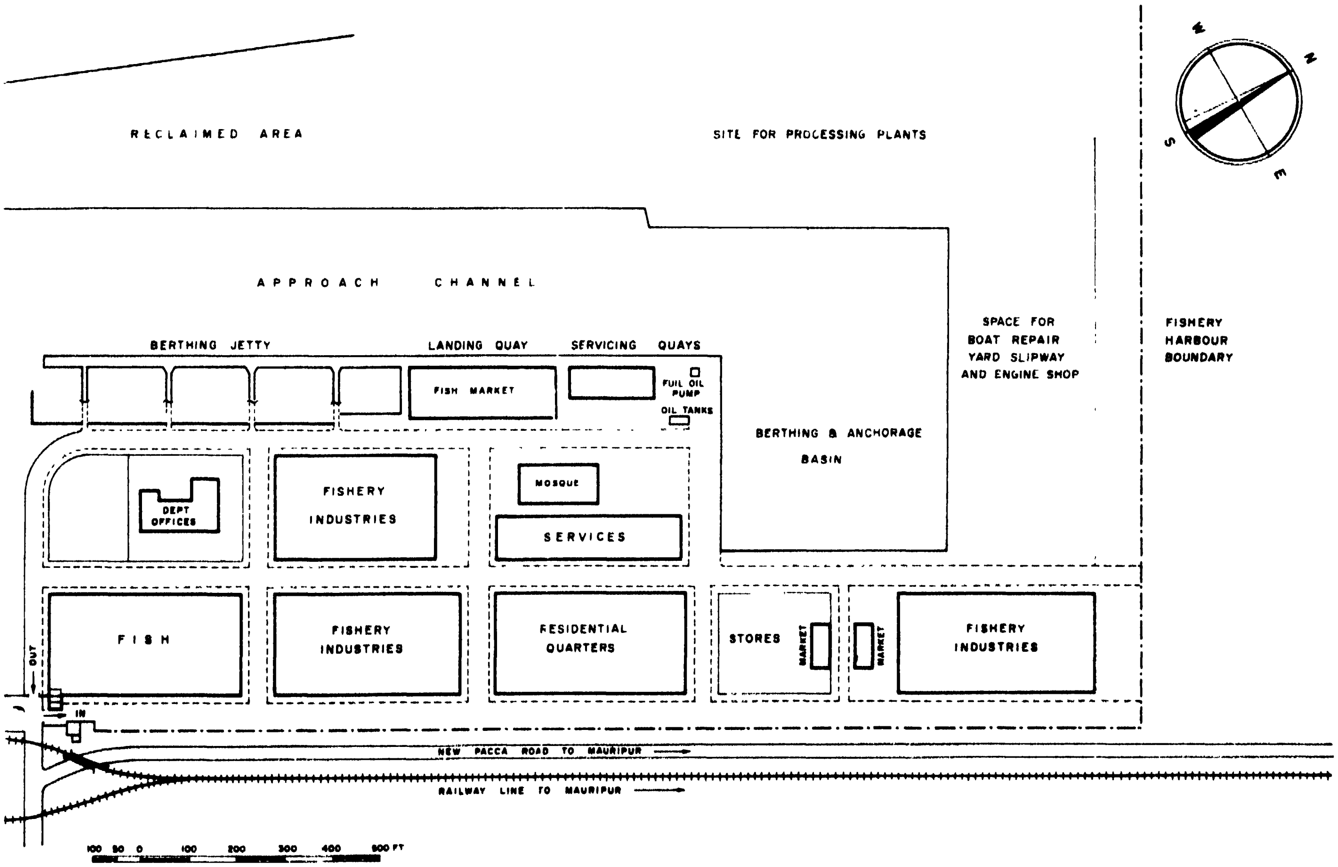

Fig 1. Site plan of Karachi fish harbour

For handling big catches of large fish, larger trollies should be provided on which about 1,000 fish may be carried. These trollies should be brought to the auction hall and the fish auctioned thereon, without unloading and then be taken out to the vehicles. To facilitate the handling of large quantities, trains of four to six trollies may be driven by small tractors through large openings in the market. For handling semi-dried and dried fish, conveyor belts or some other device may be used.

ADMINISTRATION OF FISHING ACTIVITIES

The administration of the fish harbour is in practice performed by the Fishermen's Co-operative Society Ltd., who manage practically all the activities excepting the fish-processing industries which are controlled by the Marine Fisheries Department on behalf of the Government. The Society is a corporate body registered with the Registrar of Co-operative Societies, Government of West Pakistan. The Board of Directors consists of seven Government nominated members and six elected from amongst the fishermen by the members of the Society every two years. Nomination is necessitated to safeguard the amount invested by the Government in the project (Rs. 10,000,000/- ($2,120,000)). The Society has been paying to the Government Rs. 500,000 ($106,000) every year since October 1959. The Society works in full co-operation with the provincial and Central Governments.

Functions of the Karachi Fishermen's Co-operative Society Ltd. are

To auction fresh as well as dry fish with the assistance of auctioneers.

To manage the jetty, fish market and other installations, excepting the buildings controlled by the Marine Fisheries Department. All repairs to the installations handed over by the Government are the responsibility of the Society.

Procurement and supply of marine diesel engines, nylon twine, synthetic floats, nylon, manila and coir ropes and other articles required for fishing. The Government has exempted these articles from import and duty sales tax to encourage fishing.

Provide medical facilities to fishing villages, for which a doctor, who runs a mobile dispensary, has been appointed. He visits the villages and gives treatment to the fishermen and their families. A hospital has been constructed at a fishing village on the Korangi Creek. All treatment is free including medicines.

Aid is given to institutions which educate the sons of fishermen. Besides, scholarships are given to the sons of fishermen seeking higher education.

Water is supplied to some fishing villages. Grants for schools and their extension and for welfare work are also given.

Maintenance and repair facilities

The maintenance and repair of the jetty and the buildings handed over to the Society by the Government are its responsibility. However dredging is the responsibility of the Government, as is the construction of additional jetties and the maintenance of roads, buildings, etc., under their control.

Works to be completed

Below are the items of the project which have not yet been completed. Some of these, excluding the jetty and the dredging, have been delegated to the Society for completion:

(a) Facilities for boat repairs, inclusive of a slipway and workshops
(b) A modern fish-curing yard where facilities will be provided to members for curing fish in hygienic conditions under the supervision of the technical staff of the Society and the Marine Fisheries Department. This curing yard will have an artificial dryer and also a small fish-meal plant
(c) A 100-ton ice making plant with freezing units, and possibly later a canning plant also
(d) An auction shed for salted fish and trash fish
(e) A private boat-building yard where land will be allotted to private boat-builders, and electricity, water and other facilities made available to them. Each boat-builder will construct his own building and equip the yard with the machines required
(f) Jetties in the turning basin and in front of the curing yard. The total area of the land reclaimed for this purpose is 113,658 m^2 (135,955 yd^2) as shown in the plan.

In planning and carrying out the projects mentioned, a request has been made to FAO for technical experts and to the UN Special Fund.

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The Port of Thorsminde, Denmark

by Evan Hansen

Le port de Torsminde, Danemark

Bien que le littoral danois de la mer du Nord présente des conditions extrêmement difficiles pour la navigation, étant donné notamment l'existence de barres de sable sous-marines et les vents d'ouest dominants, il offre néanmoins quelques points se prêtant à la pêche côtière. Torsminde, à peu près à mihauteur sur le littoral ouest du pays, est situé au débouché d'une lagune. La navigation n'y est pas aisée, mais les pêcheurs locaux parviennent à débarquer des quantités croissantes d'excellent poisson frais, vendu directement au consommateur. C'est leur succès qui a encouragé la décision d'implanter en 1966/67 un nouveau port à l'ouest de l'écluse qui règle le niveau de l'eau dans la lagune. Les installations peuvent abriter et servir une soixantaine de navires de 20 à 25 tjb.

L'auteur décrit l'emplacement du port et ses fonctions, et notamment les moyens de chargement, de débarquement et d'accostage. Il fournit des précisions sur la construction des diverses installations, ainsi que sur le réseau routier et l'éclairage. Il conclut en indiquant le coût des principaux éléments de construction et le prix de revient de chacun des postes à quai.

El puerto de Thorsminde, Dinamarca

Las condiciones de la navegación a lo largo de la costa danesa del Mar del Norte son my difíciles debido, en parte, a la formación de bancos submarinos y a la existencia de vientos del oeste, pero hay unos cuantos lugares frente a la costa que ofrecen la oportunidad de pescar en caladeros cercanos a ella. Hacia la mitad, aproximadamente, de la costa occidental se encuentra Thorsminde, puerto situado en la embocadura de una laguna. En Thorsminde la navegación no es fácil pero los pescadores locales saben desenvolverse en el medio en que trabajan y desembarcan cantidades cada vez mayores de excelente pescado fresco que venden directamente a los consumidores. Fundándose en el éxito obtenido por los pescadores, en 1966/67 se construyó un nuevo puerto al oeste de las esclusas que regulan el nivel de las aguas de la laguna. El puerto dispone de instalaciones y de espacio para albergar a unas 60 embarcaciones de hasta 20 a 25 toneladas de registro bruto.

El informe examina el emplazamiento del puerto y sus funciones, junto con las instalaciones de carga, descarga y atraque. Describe las características de construcción de las distintas instalaciones, incluidas las carreteras y el sistema de iluminación. Acaba el informe dando una lista de precios de los principales elementos de construcción, y las tarifas de atraque de cada embarcación en los muelles y embarcaderos.

THE west coast of Jutland, from the Skaw to Blaavand, is subject to movement and drift of sand. The shifting materials have long since closed the shallow bays with narrow sandbars. At a point roughly midway along this coastline is Thorsminde, situated on the narrow strip of sand that shelters Nissum Fjord from the North Sea (fig. 1). The fishing village of Thorsminde grew up alongside a system of locks whose object originally was to regulate the water level in the fjord in order to provide good working conditions for the farmers of the immediate vicinity. The present lock was constructed in 1868–70, but in 1880 and the years immediately following, the mouth was silted up completely. It was not until 1930 that the lock was again cleared and put in working order.

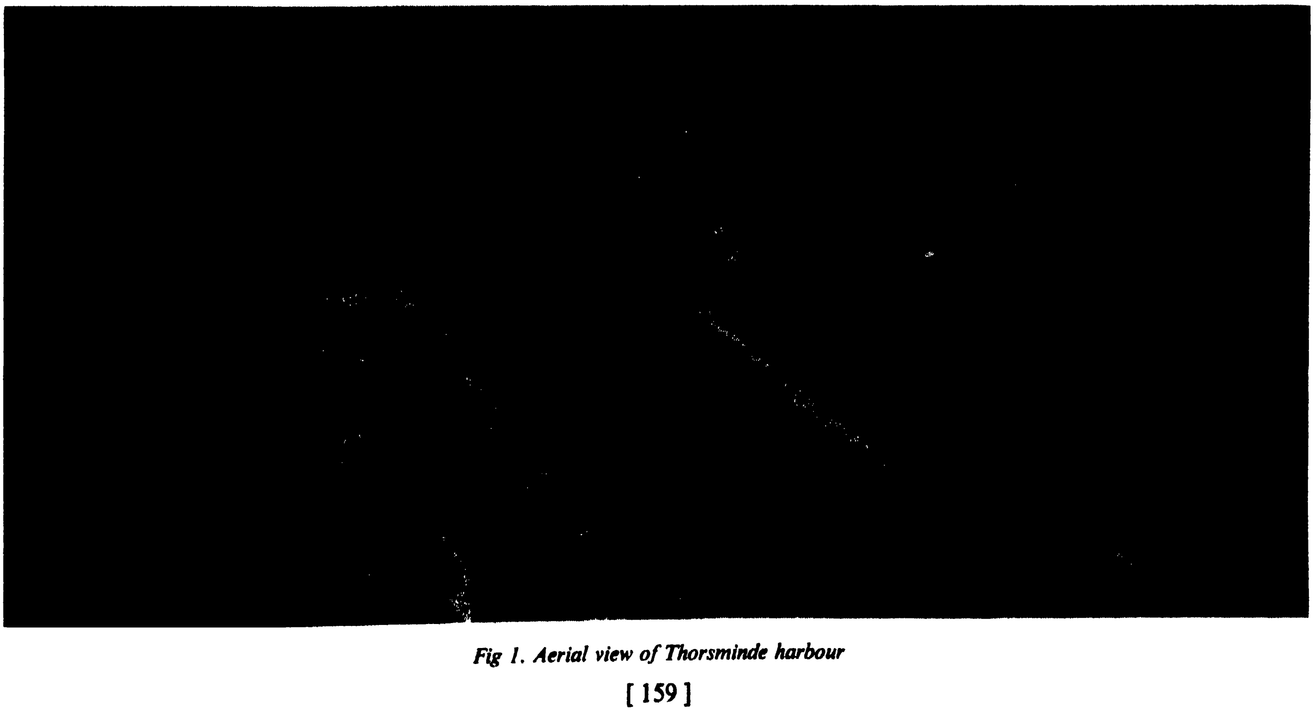


Fig 1. Aerial view of Thorsminde harbour

It was augmented by two new drainage outlets and a ship canal lock, the main channel was dredged, and a northern and a southern pierhead were built.

Fishing conditions

Despite the very difficult navigational conditions as one sails across the sandbar (which frequently extends across the mouth of the channel after a spell of rough weather accompanied by winds veering from W to NW), the number of locally registered fishing boats has increased to 42, and the average size of the boats has also risen. Most are now in the 17 to 20 GRT class. The principal reason for this development, in spite of unfavourable natural conditions, is no doubt concealed in the fact that Thorsminde can offer good coastal port facilities when the fleet returns from nearby fishing grounds with such expensive fish species as sole, plaice and turbot which can be landed quickly and carefully by these relatively small vessels, thus preserving the excellent high qualities of the catch. Gradually it became evident that there was insufficient room in the modest old harbour situated to the east of the lock, and entry into the harbour from the west had to be effected via the narrow ship canal which can accommodate only one vessel at a time, and as the lock takes about ten minutes per operation there were often long periods of waiting when the whole of the fishing fleet or a major part of it wanted to pass through the lock at the same time. It was therefore decided to build a new port west of the lock. The work commenced in the spring of 1966 and was completed at the end of autumn 1967, having cost a total of D.kr. 4.5 million ($600,000).

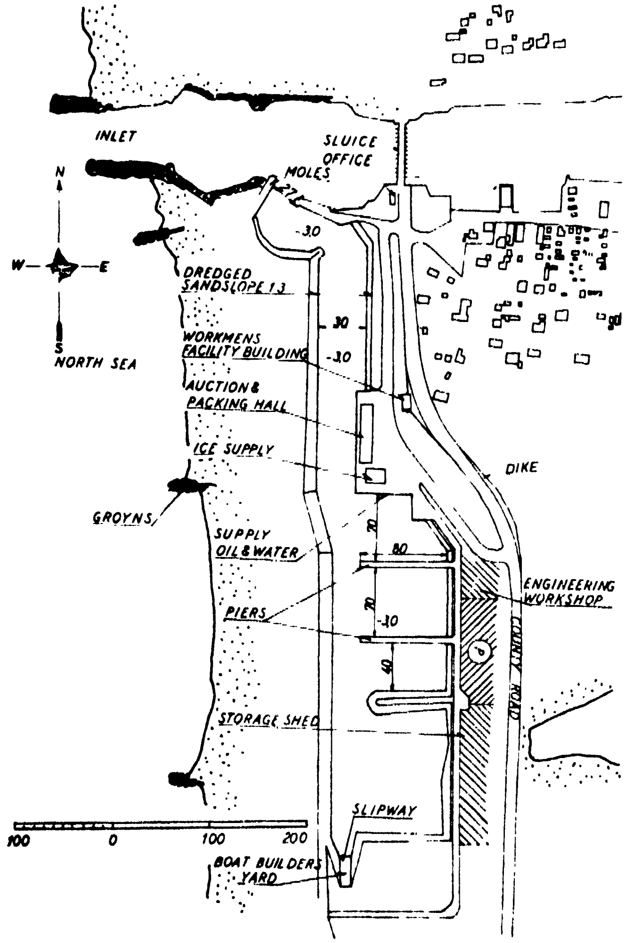


Fig 2. Plan of Thorsminde harbour

Harbour approaches

In the sea off Thorsminde the difference between daily high water and low water is approximately 0.5 to 0.6 m (1.6 to 1.9 ft). In extreme cases the west wind can produce high water of 3.0 m (9.9 ft) and the east wind low water of 1.8 m (5.9 ft). The depth on the sandbar varies considerably and is seldom more than 2.5 to 3.0 m (8.25 to 9.9ft). There is therefore no requirement for a greater depth in the harbour basin than 3.0 m (9.9 ft).

In planning the new port, the area at the planners' disposal was bounded in the west by the sea (where a certain degree of coast erosion is recorded) and in the east by a dike built to prevent stormy seas breaking through the narrow, low isthmus (fig 2). The harbour was thus designed with an inlet (measuring about 27 m (90 ft) wide located in the canal in such a way that the currents were more or less unaltered and waves were prevented from penetrating the basins. At the same time the entry angle was reasonable.

Within the sheltered area a canal measuring about 150 m (500 ft) long and 30 m (100 ft) wide leads into the port area proper, which is located where the distance between the dike and the sea is greatest.

The wharf serves as the harbour's discharge and supply area. It houses an auction hall and ice store (fig 3). The south face of the wharf is used as a supply quay for ice, oil and water. The areas are fairly small because account has been taken of the fact that with a high water level of +3.0 m (+9.9 ft) and a quay height of +1.8 m (+5.9 ft) the number of buildings located on the harbour front should be kept to a strict minimum: auction hall, ice store and tool-sheds, etc.

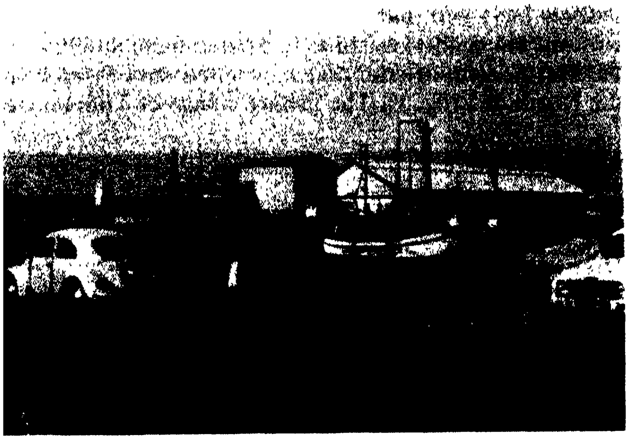


Fig 3. View of wharf from pier, showing ice store and auction hall

The harbour office and workmen's welfare building have been built on the dike out of reach of high tide. The auction hall has an area of 750 m² (8,100 ft²) and incorporates a packing room for exporters, providing a total floor area of about 1,100 m² (10,800 ft²) (fig 4).

Approach to the harbour area from the landward side is via two road ramps, leading from the nearby county road. The ramps have been located in such a way as to give the discharge and supply area easy access to the county road network and the northern ramp has been taken right up to the lock to allow for the possibility of a later extension of the wharf.

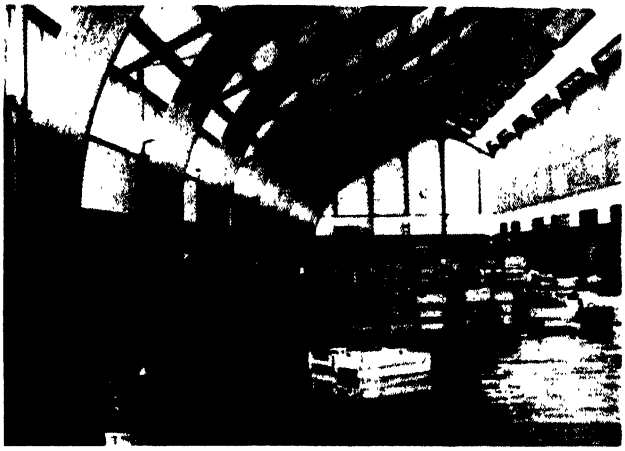


Fig 4. The auction hall was built on a skeleton of laminated timber arches. Doors into packing hall are seen on right

The berthing basin, south of the wharf, is split into 70 m (230 ft) wide basins by two piers, and the depth of water here and in the remainder of the port is 3.0 m (9.9 ft).

The area between the basins and the dike is to be used as parking space and the site of worksheds. There is a workshop near the southern road ramp.

South of the berthing basin, an area of about 160 m (520 ft) in length was earmarked for further extension which, if necessary, could double the port's capacity. The sand dredged out of the harbour during construction (totalling 235,000 m³ (306,000 yd³) was placed on a site south of the area that may be used in future extension. A boat-building yard has been located here in such a manner that it will not interfere with any extension that may be carried out at a later date.

DESIGN OF THE STRUCTURES

The breakwaters surrounding the harbour entrance were built of mutually anchored steel sheet pile walls with added slopes having a gradient of 1 : 3 under datum minus 0.5 m (1.6 ft) and a gradient of 1 : 2 datum line minus 0.5 (1.6 ft). All slopes with gradient of 1 : 2 are surfaced with rubble mounds to protect the subsoil (sand and a limited amount of gravel) and in particular to counteract the movements of the waves. The west slope was completed with a small stone-filled pier, at the foot of which were placed two lightweight dolphins, marked by flashing lamps. The reason for attaching so much importance to the wave-absorbing structure is that a heavy swell could be experienced at the entrance to the harbour in certain conditions, partly associated with a backward swell emanating from the lock gates.

No special wall has been built along the channel leading to the wharf. To keep the cost of construction as low as possible rubble side slopes were not added, being finished in plain sand with a 1 : 3 gradient. This also applies to other harbour boundaries which face toward the water, with the exception of the wharf and the pierheads. It was known that sand slopes with a gradient of 1 : 3 could stand up well to use in protected inner basins, but at the same time that it might be necessary at one or two points to reinforce the slopes with gravel and shingle. In the event, however, it has proved necessary only on the east side of the channel from the harbour entrance to the wharf.

Solid quay structures

The wharf and the entrance pierheads are the only structures in the harbour which have solid vertical faces. These are walls of steel sheet piling with a weight of 100 kg/m² (20.5 lb/ft²), and in order to counteract the corrosive effects of rust the walls have a thickness of 9.5 mm (0.37 in). As corrosion, particularly near low water levels can be extensive, the steel sheets were given a coating of anti-rust preservative on the face turned toward the basin This was executed by sandblasting between datum levels +0.5 m (+1.6 ft) and −2.0 m (−6.5 ft) followed by two coats of U-pox bitumen with a total thickness of minimum 250 my.

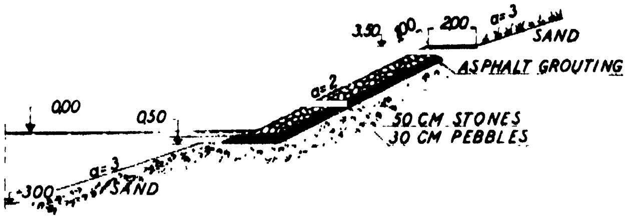


Fig 5. Cross-section of slope in entrance channel

Bollards, pierheads and piers were fitted with storm posts to protect boats against damage at high tide. The posts were taken to a height of +4.0 m (+15 ft).

Open work structures—timber

The shore boundaries of the berthing basin were also made in the form of simple sand slopes because there was little benefit to be derived from vertical walling.

The two piers in this basin are built of timber, each with an effective length of 80 m (260 ft), width of 6 m (20 ft) and bearing capacity for two-ton trucks.

The two piers provide berthing facilities for 60 boats of the "Thorsminde" class, five berths on either side of the piers and berthing three abreast. Distance between the piers is 70 m (220 ft) so there is ample room for manoeuvring even when the piers are fully occupied. The vertical and inclined timber piles of the piers are of basralocus, the fender and pier edging of azobe. The primary cross-members are two UNP 32 steel members, the secondary longitudinal members and decking are of preserved pine. The piles in each section are connected by the two UNP

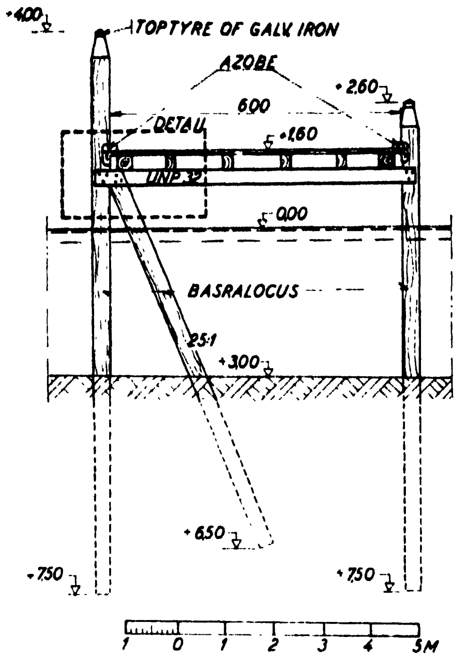


Fig 6. Cross-section of pier

32 members to form a rigid construction. The steel girders act as butt straps for transferring force from the vertical to the inclined piles and vice versa. To avoid locating the bolt holes too close to the sawn-off end of the inclined pile and thus risking a split in the timber, the inclined pile was extended up under the pier decking and fastened to the vertical pile by means of a galvanized steel band or tyre. Distance between pile faces is 4 m (13 ft), and the inclined piles are located on the north and south sides of the piers alternately.

Timber qualities. Basralocus wood was employed for the vertical and inclined piles in the piers at Thorsminde (figs 6, 7 and 10), and also for the vertical piles of the dolphins. The choice was made on the basis of the resistance

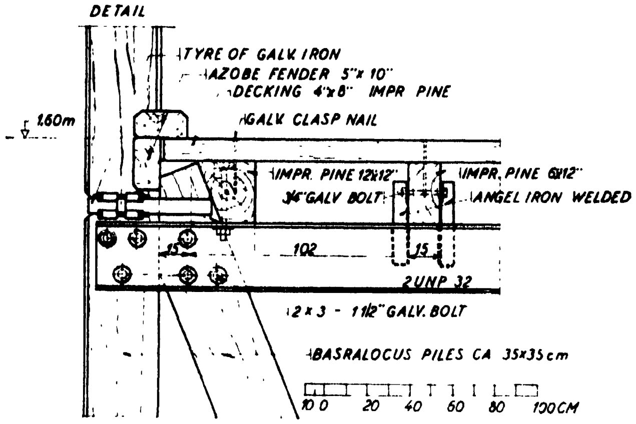


Fig 7. Detail of pier decking, showing junction of vertical and inclined piles (basralocus)

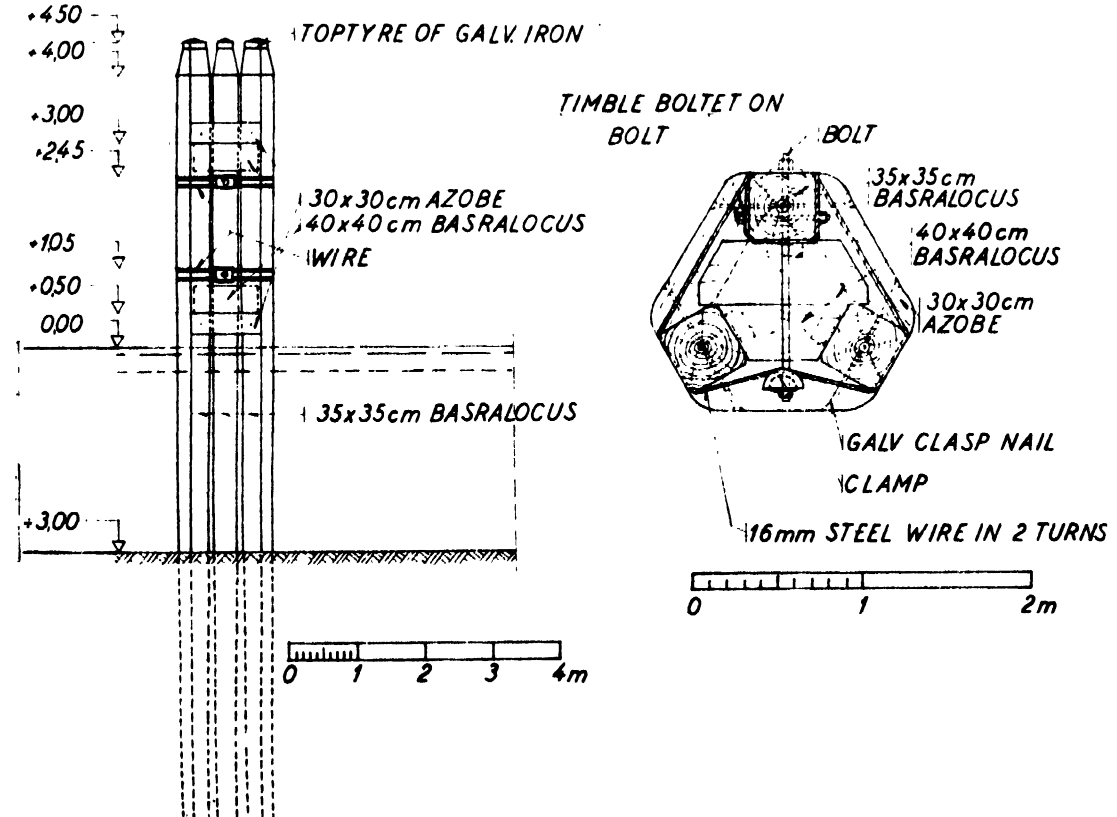


Fig 8. Flexible dolphin constructed of three vertical basralocus piles

of this timber species to rot, pile-worm and other attacks, and because of its wearability and great strength, which enable it to absorb the movement of ships, etc. The timber is delivered in square sections and when the length of the pile is given, the side length, e.g. the side length of the root-end, is also given. This usually means that pile-driven constructions at depths normally suitable for Danish subsoil conditions will have an excess of strength (compressive, bending and shearing strength). The timber, which has a certain silicon content, is not difficult to work if one uses cutting and drilling tools with hardened steel tips, but it is more liable to split than, for example, pine. It is therefore necessary in locating bolts, spikes, etc., to drill a pilot hole first. Tendency to splitting may also be counteracted by the use of butt straps and adjustable bands. The free top ends of the piles, which are subject to drying would also be subject to a certain risk of splitting. To avoid this, however, they were fitted with top bands and given a dense white finish.

Azobe wood was used for the pier edging and fenders of piers and for the edging and storm posts of the wharf and pierhead steel sheet piling (figs 8 and 9). Azobe is resistant to rot and insect attack, but not so resistant to pile-worm and other similar attacks, and was therefore employed above water level where its heavy, close-fibre structure provides excellent qualities of wearability. As regards the workability and splitting properties of this timber, it resembles basralocus in almost every respect.

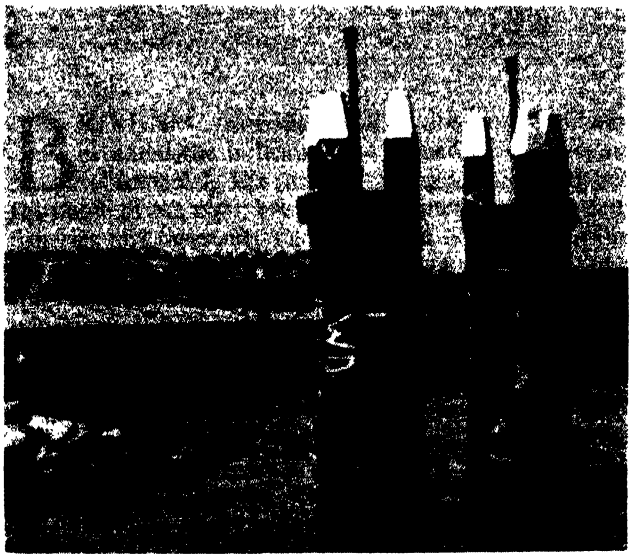


Fig 9. The completed dolphin

WHARF AND ROAD SURFACING

The wharf and roads were given a simple asphalt surface. The make-up of the roads comprises a foundation of 15 cm (6 in) plain gravel and 25 cm (10 in) stabilizing gravel, the dimensions being post compression thicknesses. The asphalt surface is of 200 kg/m² (45 lb/ft²) Hot-Mix and 60 kg/m² (12 lb/ft²) asphalt cement wearing surface. The outer edging of all road surfaces was finished with three rows of cobbles. While the road was under construction a small drainage system was laid along the east side of the auction hall for the drainage of surface water off part of the wharf and to handle the overflow of rinsing water from the hall itself. The west pier and the top of the slope along the channel entrance, which will **not** have to handle traffic, was given a surface of 300 kg/cm² (58 lb/ft²) Hot-Mix directly on top of the levelled soil to prevent waves washing the sand out of place.

Fig 10. The completed structure

ELECTRICITY SUPPLIES

A great part of the harbour's function is conducted during periods of the year when artificial lighting is necessary. To provide good, even working light the lamp locations and heights and distances were fixed to ensure at least 40 lumen per square metre of road or wharf.

Harbour lighting comprises 2 × 40 watt neon strip lights mounted on 8.5 m (28 ft) high tubular standards placed at intervals of 25 m (82 ft) along the wharf and roads, a total of 27 lamp standards, and on 5.5 m (18 ft) high tubular standards on the piers, totalling another eight standards. All standards have a reach of 1 m (3.3 ft) and the lamps slope at 5° to horizontal, which ought to eliminate dazzle. The on-off control is effected by a photocell. The lighting system has a "night-time" network which switches on only every third lamp, and there is a relay in the auction hall so that the full harbour lighting system can be switched on if it should be required during the hours of darkness. The lighting system also incorporates five pier-located power points and the harbour's lighthouse, which in the event of a power failure can be operated by an emergency generator. Total energy consumption for lighting purposes is approximately 10 kW. The kW-consumption for motorized installations at the harbour (ice store, boatbuilder, smithy, oil pumps, etc.) is approximately 85 kW, but the cables, etc., are sufficiently heavy to allow for an expansion of consumption.

COSTS

The cost of the major construction items and services are:

	D.kr. *unit*	*US$* (approx.) *unit*
Deepening carried out by excavator with perforated dragline bucket, transport distance averaged 500 m	4.20 m^3	0.56 m^3
Sheet pile walling, driven and assembled	2,000.– m	265.– m
Piers, per effective m	3,700.– m	490.– m
Road surfacing	34.– m^2	4.5 m^2
Lighting, price per fully equipped standard	3,500.– unit	465.– unit
Auction hall: Cost of hall area	700.– m^2	93.– m^2
Cost of packing room area	525.– m^2	70.– m^2
Cost per metre run of complete units		
Quay, including sheet piling, deepening, road surfacing, lighting and drainage	5,100.–	690.–
Piers, including deepening, access roads and lighting	8,200.–	1,090.–
Dolphins per unit	10,300.–	1,365.–
Cost per boat space (boat lengths fixed at 16 m)		
A berth at the wharfside in the load/discharge section	81,600.–	10,850.–
A berth at the piers (boats three abreast)	22,000.–	2,920.–

The New Fish Market and Quay at Brixham, Devon, United Kingdom

by E. W. H. Gifford

Le nouveau marché au poisson et quai de debarquement de Brixham, Devon, Royaume-Uni

Aprés avoir exposé la nécessité d'installations améliorées pour la mise à terre et la vente des produits de la pêche, l'auteur montre comment les nouvelles installations répondent aux besoins.

Sont prévue des postes d'accostage pour 45 chalutiers modernes de pêche côtière, débarquant annuellement environ 3,000 tonnes de poisson de fond de bonne qualité, une halle de vente, des emplacements pour le traitement et l'emballage des produits, une fabrique de glace, des magasins d'articles pour pêcheurs, un slipway et des bureaux pour les services de commercialisation et d'inspection.

L'auteur décrit le mode de construction (essentiellement béton préfabriqué).

El nuevo mercado y el muelle pesqueros de Brixham, Devon, Reino Unido

En este estudio se indica la necesidad de que se mejoren las instalaciones y servicios de atraque y comercialización así como la manera en que el nuevo diseño ha satisfecho estas exigencias.

En el plan figuran instalaciones y servicios para una flota de 45 arrastreros modernos de bajura que desembarcan approximadamente 3.000 toneladas anuales de pescado blanco de buena calidad, incluyendo dichas instalaciones un mercado, sectores para elaboración y el envasado, una fábrica de hielo, pertrechos para los pescadores, un varadero y oficinas de venta e inspección del pescado.

Se describe el método de construcción, consistente principalmente en elementos prefabricados de hormigón.

BRIXHAM fishermen claim not only to have invented the bottom trawl in mediaeval days, and subsequently the famous sailing ketches that bear the name of the port, but to have founded the East coast fisheries of Lowestoft, Yarmouth and Grimsby and thus the whole world's trawling industry. Be that as it may, they were so successful in fishing on the rich grounds nearby that, on an approximate estimate, by the end of the 19th century they were landing 3,000 tons of fish a year with a fleet of 270 sailing trawlers.

The town of Brixham is situated in Devon on the South coast of Britain (fig 1). The mediaeval harbour which occupies a narrow inlet in a rocky, cliff-girt coast, is well sheltered from the prevailing South and South-West winds but it dries out at low tide. The new pier was built in 1799 to give better protection from northerly and easterly weather and a few berths at its extreme easterly end which did not dry out at low water. The fish were generally landed from rowing boats, as the big ketches were rarely berthed alongside except when refitting or taking on heavy gear. They were moored outside the old harbour under the protection of the Mole, which was built in stages, starting in 1843 and completed in 1916.

After the First World War Brixham fishing declined partly because the fishermen, many of whom had served in the Navy during the war, had realised that the harsh work of sailing-trawling was not the only way of living, and partly because the growing depression was forcing down prices. Frequent losses of gear on wrecks made trawling expensive. Steam trawlers were tried but they were too big for berthing alongside the new pier and it was uneconomical to ferry their large catches ashore in rowing boats. But the development of the smaller 13 to 22 m (45 to 75 ft) long diesel-engined trawler, combined with accurate radio navigation for locating wrecks and fish, has changed the picture.

The industry has been further encouraged by the creation of a marketing co-operative which has found new buyers and has obtained better prices for the fishermen so that landings have risen from 1,500 tons in 1964 to 2,600 tons in 1967. There is now a fleet of 45 boats ranging in size from 14 to 23 m (45 to 75 ft). The annual increase in value of the landing is expected to continue at not less than 10 per cent for many years. The Brixham catch has been predominantly of good quality white fish, such as sole, plaice and turbot. Mackerel and sprats are fished when the shoals are near. So the port is able to expand its business at a time when the demand for better quality fish is growing at the expense of frozen cod.

This heartening revival has become self-energizing in that newcomers have been attracted to the business so that, far from being a dying trade carried on by a few tough old men as it had been in the 1930's, it is now an attractive industry for young men to enter. The average age of seagoing fishermen at Brixham is now only 28 years!

But this great fishing revival has overwhelmed the archaic landing facilities. Trawlers must arrive in the harbour before low water if they are to land their catch onto the quay and the fish must then be transported in trolleys some 200 m to the market, through a main street thronging with visitors in summer. The ice must also be carried from the ice-plant in the same way. This wasteful movement costs £5,000 ($12,000) a year in labour alone. But the fishermen's troubles are not over when they have berthed, for the falling tide leaves their boats dry, and liable to damage (fig 3). They cannot go to sea again until the tide returns so that fishing time is often lost. Until a few years ago, fishing boats were hauled out for repairs at Uphams famous shipyard to the East of the harbour entrance. But now this yard deals exclusively with pleasure yachts so that fishing boats must be taken 180 km (110 mi) down the coast to Newlyn in Cornwall for haul-

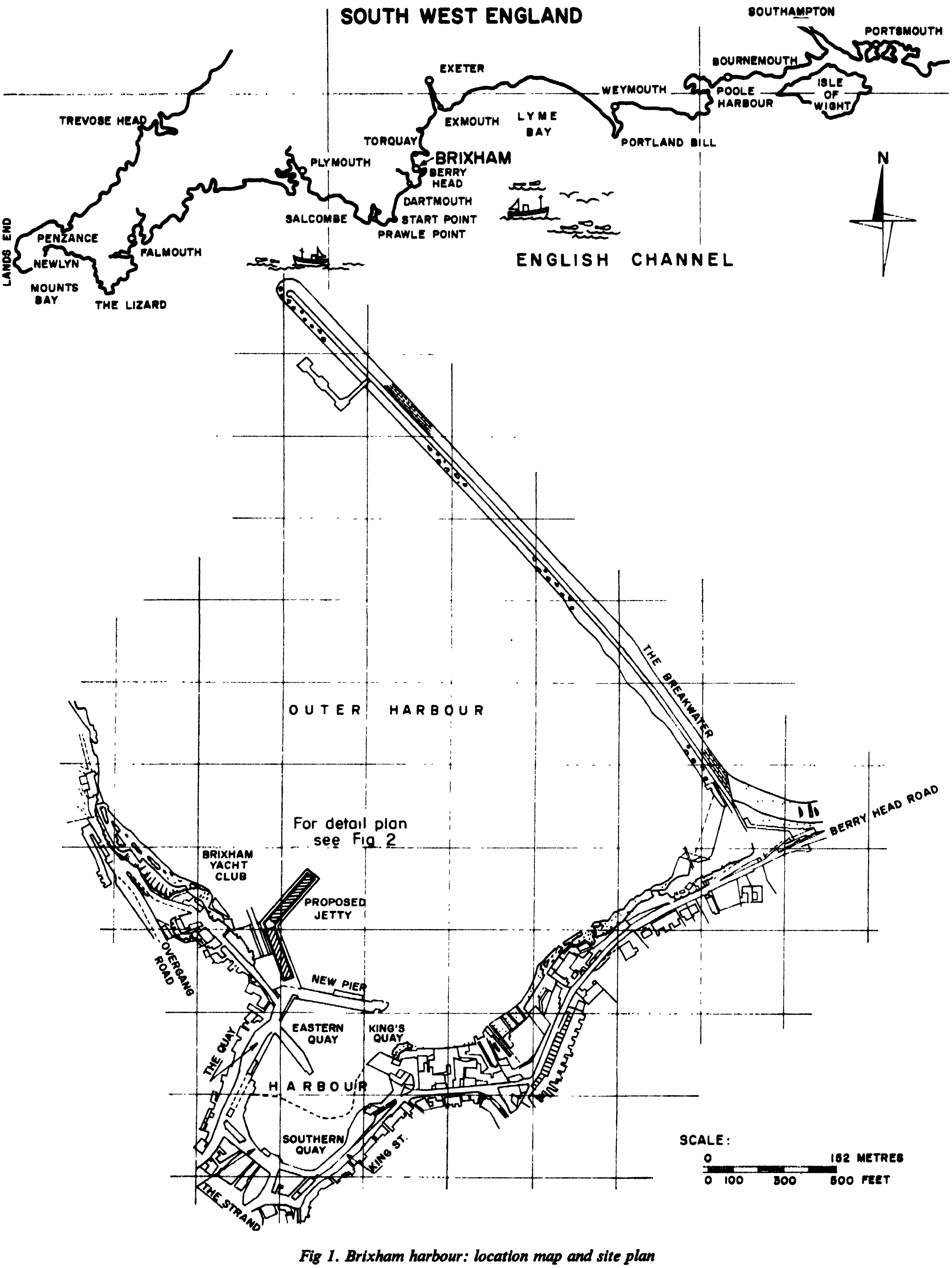


Fig 1. Brixham harbour: location map and site plan

ing out, a round trip of nearly a week. Additional problems have been created by the rapid growth of a popular tourist industry, which attracts large crowds of visitors to the fishing harbour area. The fishermen's stores around the harbour have been taken over by the tourist trade or have been pulled down so that gear is now scattered in inconvenient places round the town. The area of quay is inadequate for laying out modern gear for repair and the main street can no longer be used for this purpose.

In these ways the pressure of increased landings on the inadequate facilities have produced conditions which could frustrate the enthusiasm of the fishermen. And so the Local Authority, Torbay Council, with the support of the Government has commissioned the construction of the new fish market and quay which forms the subject of this paper.

Improvement by dredging of the mediaeval harbour is impracticable partly because of the limestone bottom but also because there is already insufficient quay space for the market and because the inner harbour is really only large enough for the small fishing boats and summer pleasure craft which now use it. Fortunately there is plenty of space for a new quay in the great outer harbour, in addition to mooring requirements for fishing vessels, commercial craft and yachts.

THE NEW QUAY

The site chosen is on the more congested West side of the harbour (fig 4), rather than the less developed East side, because it has better road access and because it is near the heart of the present harbour activity. The eastern Mole is too narrow for vehicle access.

It would seem that for maximum efficiency, one-third of the fleet should be able to lie alongside the market at any one time. If it is assumed that the fleet could grow from its 45 boats to 60, then 20 berths should be provided requiring a total length of berth of 250 m (825 ft). This has been provided by means of a main jetty which projects out for a distance of 65 m (214 ft) from a minimum water depth of 2 m (6.6 ft) to 4.5 m (14.8 ft) (fig 5). The balance of the berths will be provided for smaller boats alongside the reclaimed area of land on which is to be built the fishermen's and box stores, processing area, single-sided market, offices, slipway and truck loading and parking area. These small boats can unload directly into the single-sided market building or directly onto the quay near the truck-loading bay, which will be a useful facility when the sprat catch is running heavily. This main trawler jetty will be situated at the North end of the reclaimed area so that the North side of the existing "New Pier", which is in continuous use in the summer time by the Torbay–Brixham ferry, will not be obstructed and so that shelter will be given to the inner berths from the northerly winds.

Estimation of dimensions

The width of the jetty has been determined by the market width plus the quay width required for unloading fish. The market width of 12 m (40 ft) is the minimum needed for double-sided operation with sufficient space to lay out the catches on either side of the central trolley road. The choice of fish quay width of 3 m (10 ft) resulted from a wide survey of fishing ports in Northern Europe. The cross section in fig 6 shows how this width provides for the unloading table and trolleys. The height and overhang of the canopy is controlled by the need to give protection from weather without fouling the mast-head whip used for hoisting the baskets onto the quay. The dimensions also give clearance for road vehicles should these ever be needed to pass down the quay in an emergency and for loading sprats direct, although for reasons of cleanliness there will normally be no external traffic into the market. Fish, after selling, will be taken on trolleys to the loading platform. For the same reason the only public access will be to a viewing gallery and not to the market floor.

Box handling

Direct access from the market has been provided to the overnight and cold stores. The store for fish boxes is on the first floor so that they will be supplied directly through overhead stacking chutes onto the market floor and process and packing area. The boxes will be lifted up to the stores by a conveyer belt leading from the loading bay. The fish will be packed in flake ice supplied by trolley from the ice plant at the end of the jetty. The processing and packing area will be equipped with filleting and packing machines.

The ice plant

As the greater proportion of ice is required for the trawlers, the plant has been placed in the most efficient place for this purpose. Ice hoppers are placed over each of the three end berths of the jetty, from which there is also direct access into the fish market, so that crews wishing to return immediately to sea after discharging their catch can make a rapid turn round. Normally, of course, vessels would go to moorings after unloading and would later be returned to the jetty head to take on ice before going to sea again.

A fourth ice hopper will discharge directly into the market from whence it will be taken by trolley to the packing areas. The inconvenience of trolleying this ice is felt to be small in comparison to the advantages of the direct discharge into boats made possible by situating the plant at the jetty head. The plant has been very carefully designed because of its conspicuous position in a beautiful harbour.

CONSTRUCTION

Although the reclamation near the shore line is most economically done by filling with rock behind a tied-back sheet piled wall, the greater depth of water under the jetty, together with the high local cost of filling material would make this method more expensive than the open jetty shown.

The harbour has a fairly level floor of limestone rock, softened on its top surface and overlaid with firm layers of silt, gravel and sand. Precast concrete piles fitted with rock shoes will be driven a short way into the limestone to give sufficient fixity for construction, although a pinned

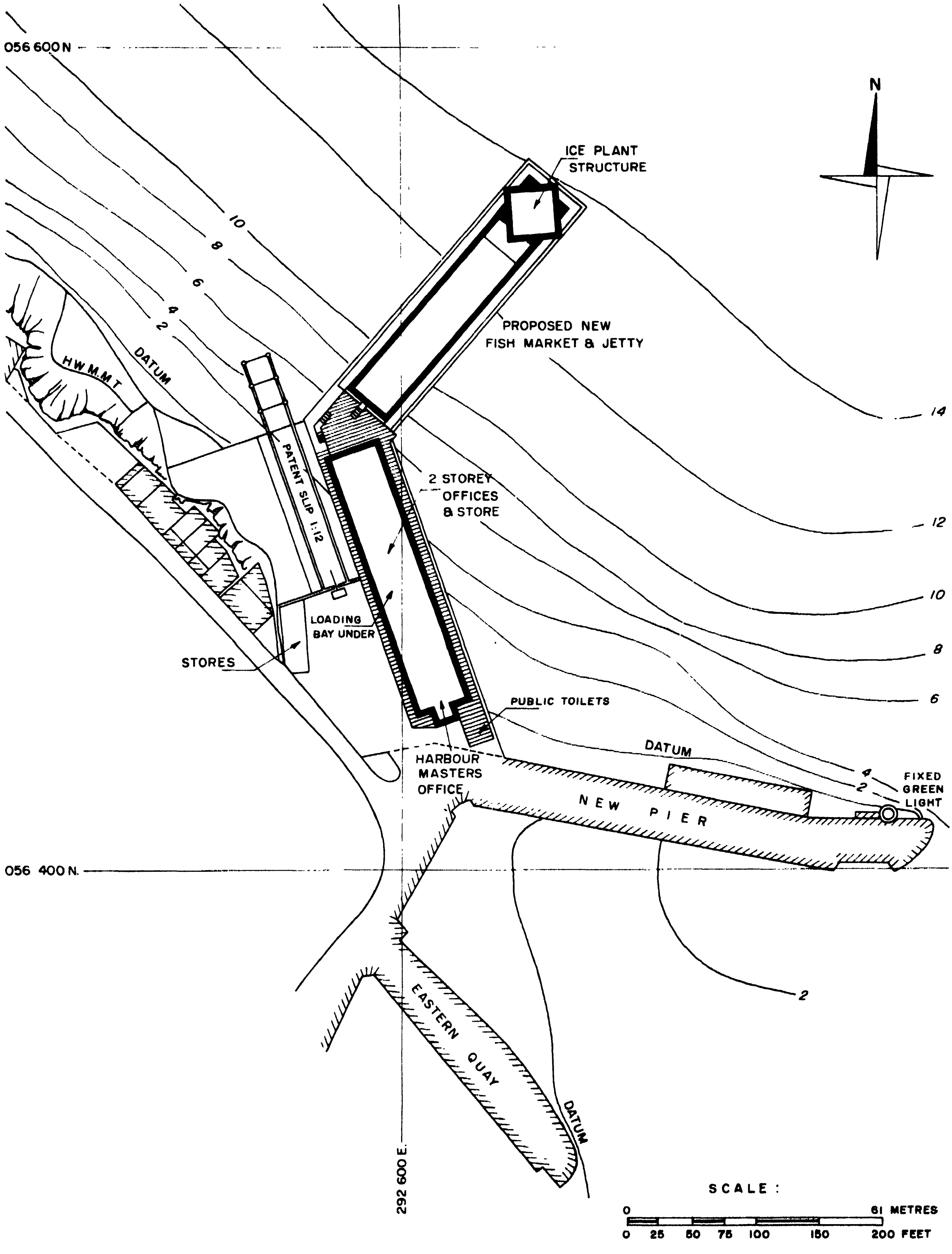


Fig 2. Layout plan for new facility

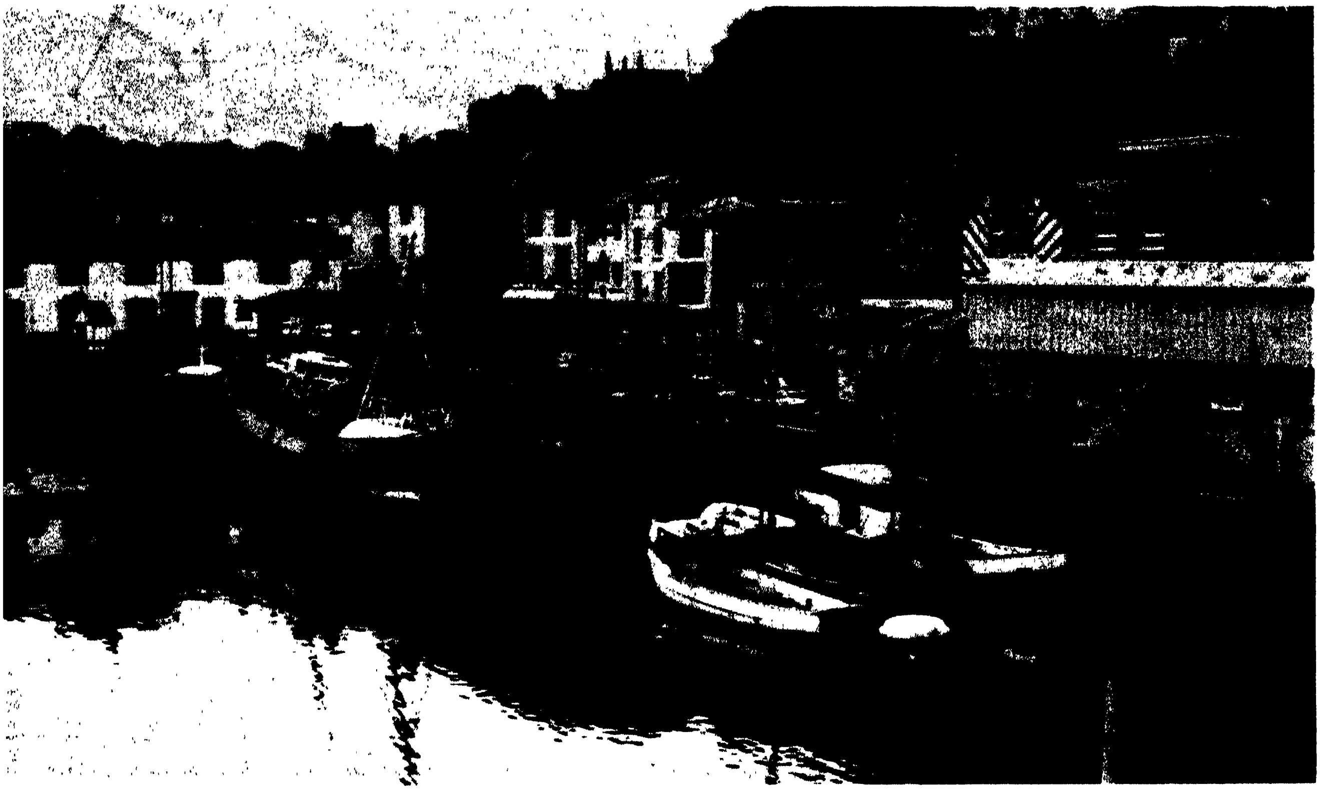


Fig 3. Existing fish landing quays

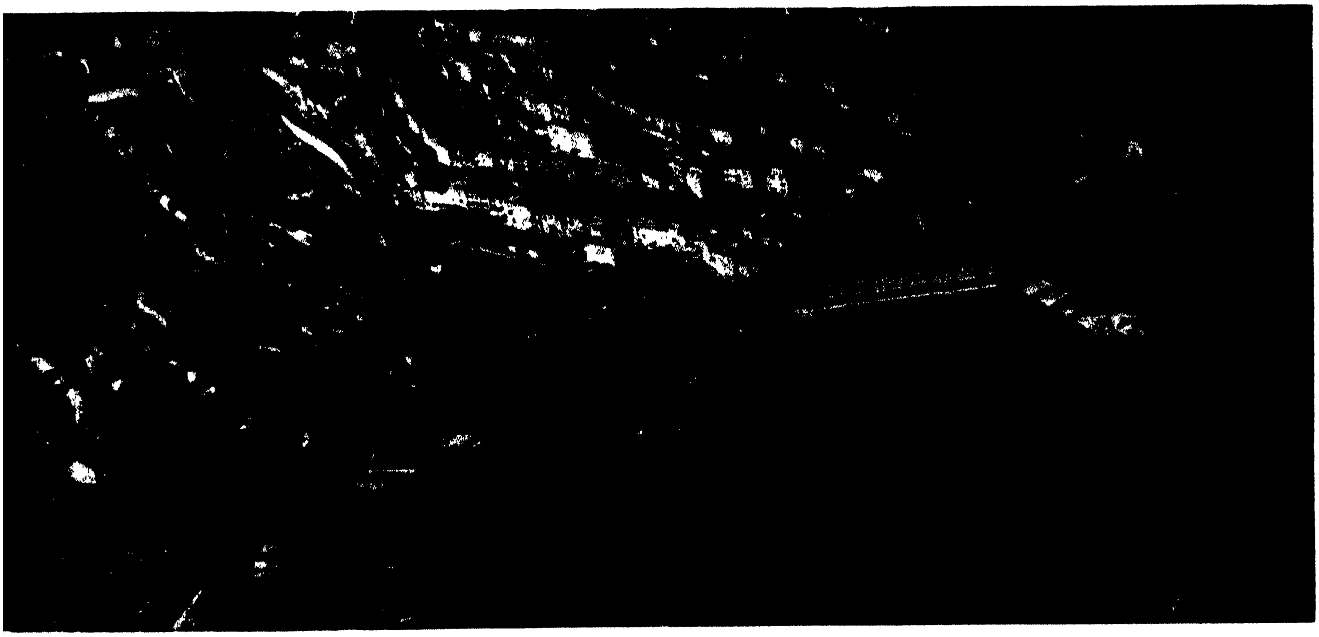


Fig 4. Proposed new fish market and jetty

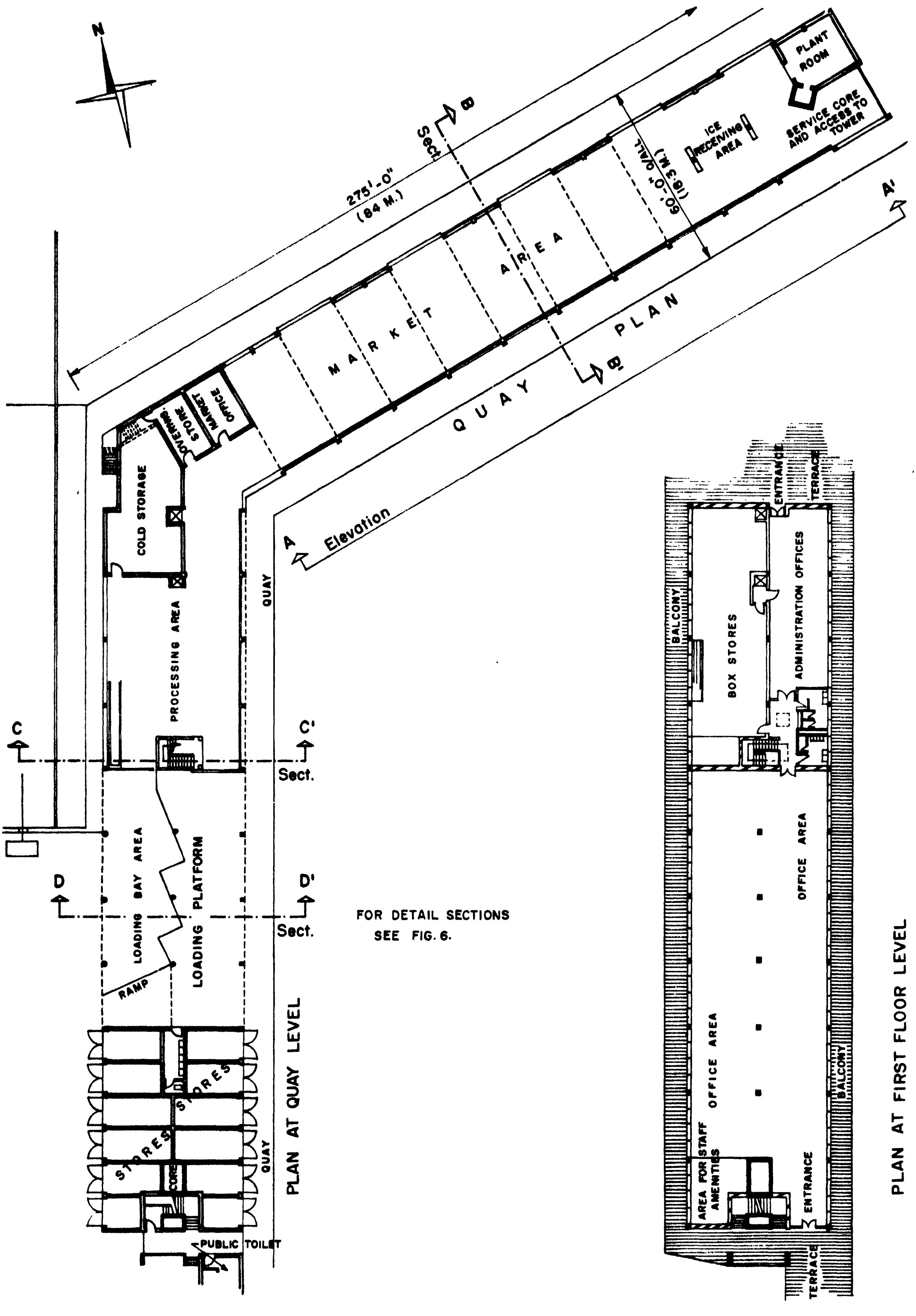


Fig 5. Plan of new market building

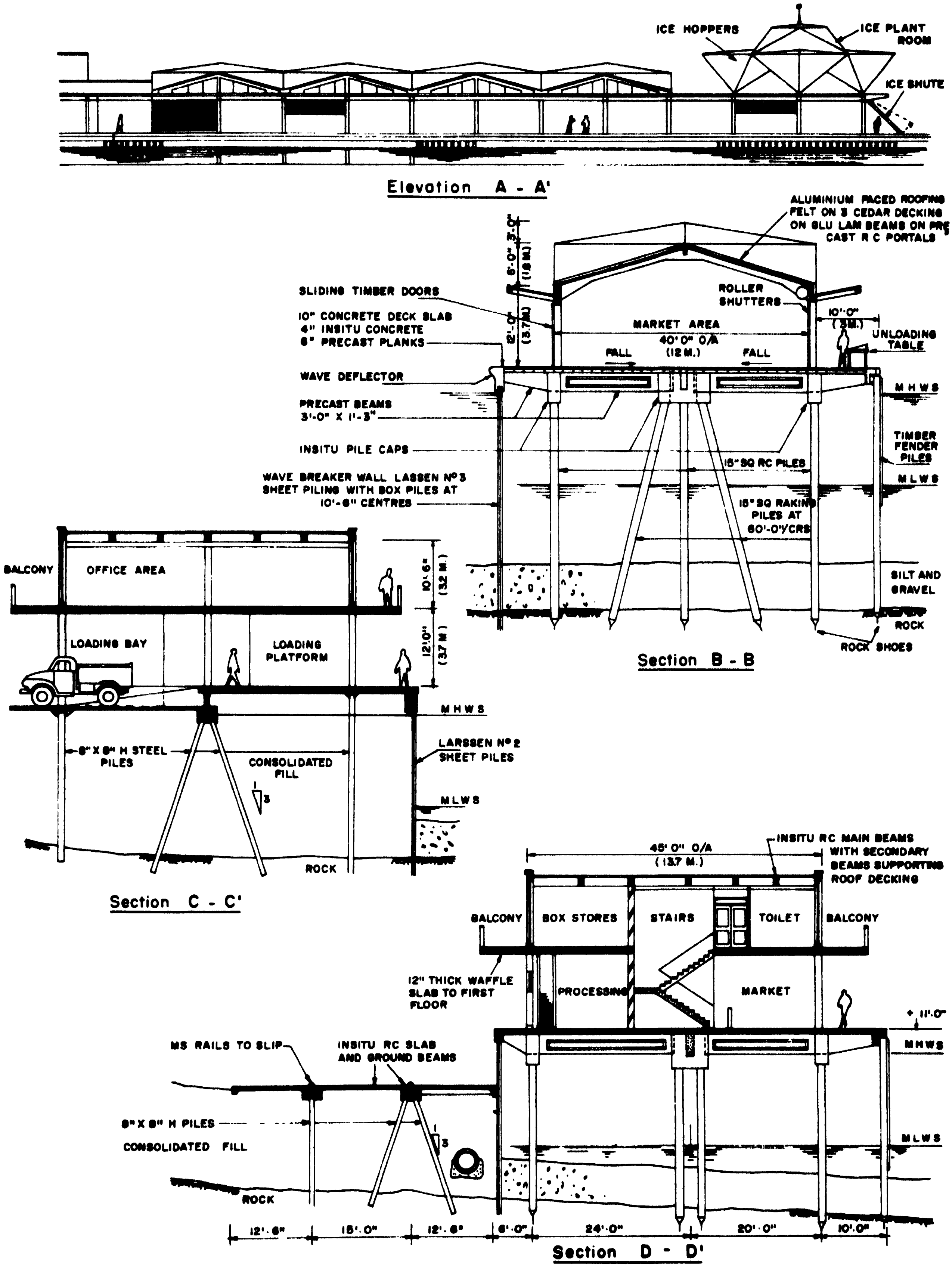


Fig 6. Section of new market and jetty

condition at the pile foot has been assumed for design of the permanent structure.

For speed and economy the deck will be built of composite precast concrete (fig 6). Large in situ concrete pile caps are being provided at the junction between piles and deck beams to allow a wide tolerance in pile driving and to give complete moment continuity. The deck slab will be built from precast slabs laid on the precast beams with an in situ concrete topping. Mild steel reinforcement projects from all precast elements so that the in situ topping bonds all parts together. In addition the in situ concrete edge beam to the quay acts as a girdle round the whole structure. This method has been used before by E. W. H. Gifford and Partners with success. It retains all the advantages of in situ concrete such as general rigidity and resistance to corrosion and impact without the difficulties of placing and removing large areas of shuttering over water.

Vertical piles will be used under the market frame columns. Ship impact based on the emergency berthing of a 1,000 ton vessel will be resisted by groups of raker piles down the centre line of the jetty, the deck slab having been designed as a horizontal beam to distribute loads between them.

Wave breaker and fendering

As previously stated, the harbour is very well protected from all directions save the North. Strong winds from this direction are rare but do occur on an average of 14 days each year. When these reach gale force over the fetch of 7.413 km (4 nautical miles) across Tor Bay, a surge of 1.2 m (4 ft) is raised in the harbour. To provide protection for this, the North face and jetty head will be provided with steel sheet piles, interposed with box piles, designed to resist wave force and impact from fishing vessels but, like the fender piles on the South face, they will not be load bearing so that if damaged they can be replaced. The vertical loads on the quay edge will be transferred to the load bearing concrete piles by the cantilevering main transverse beams.

Small vessels cannot moor conveniently against an open jetty because their fenders will not remain in contact with the piles, nor is a sheet piled wall entirely satisfactory. A floating fender with 0.3 m (12 in) square soft wood core, threaded through old car tyres, will span between the 12 in square greenhead fender piles such as that successfully used at Newlyn, Cornwall. A similar fender will be used on the North side to keep the boats clear of the overhanging wave deflector.

Market construction

All the buildings will have reinforced concrete frames. The two-storey section will have precast columns and in situ floors, whilst the single storey market area will have precast concrete portal frames, linked longitudinally with precast eaves beams.

The roofing of the fish market will be of 84 mm (3 in) thick interlocking cedar planking, covered with a waterproof membrane having an aluminium upper surface. This construction combines good insulation and reflection with an attractive appearance inside and out.

On the sheltered South face of the market, which will be the most used side of the jetty, roller-shutter doors will be fitted to every bay. But on the North side, where weather conditions will be more severe, alternate bays only will open and these will be fitted with heavy sliding wooden doors.

Natural lighting will enter through the glazed gables of the pyramidal shaped roof or through open doors. The catch will in this way be protected from direct light.

Ice plant

Ice will be delivered at four positions at the end of the jetty, three being at trawler berths and one in the market. Four 20-ton capacity hoppers, of inverted square pyramid shape, will be built directly over each position so that the ice can discharge directly through flexible hoses without mechanical complication or danger of blockage.

The plant room, which will house eight flake ice machines each of 4 tons per day capacity, extends over the hoppers so that the ice will fall directly into them. The heavier plant such as compressors will be situated in a plant room at market floor level.

The hoppers and upper plant room will be of triangulated steel frame construction with aluminium external cladding, expanded polystyrene insulation and with galvanized steel hopper linings, made up into sandwich panels to form a stressed skin construction.

Appendix

(1) Market	883 m^2 (9,500 ft^2)
(2) Processing and packing	130 m^2 (1.400 ft^2)
(3) Box stores	177 m^2 (1,900 ft^2)
(4) Cold stores and refrigeration room	112 m^2 (1.200 ft^2)
(5) Market office	22 m^2 (240 ft^2)
(6) Toilets and canteen	56 m^2 (600 ft^2)
(7) Administrative offices	84 m^2 (900 ft^2)
(8) Fishermen's stores	227 m^2 (2,400 ft^2)
(9) Additional offices and stores	260 m^2 (2,800 ft^2)

Areas 1, 2, 4, 5 and 8 are situated in the single storey market building and on the ground floor of the two storey building, whilst areas 3, 6, 7 and 9 are on the first floor. The additional offices (9) will be let to fish merchants, fishery inspectors and other related interests.

Acknowledgements

The author wishes to thank Mr Williams of the Ministry of Agriculture, Fisheries and Food; Mr A. Sharples of the White Fish Authority; Mr M. Galin and Mr W. Mogridge of Brixham and Torbay Fishery; Mr M. E. Hawkins of County Borough of Torbay, and Mr A. W. Grinyer of his own practice, for their assistance in the preparation of the scheme on which this paper is based.

DISCUSSION

STRUCTURAL DESIGN—CONSTRUCTION AND MAINTENANCE OF HARBOURS

Van der Waard (Netherlands—Chairman): Referred to the several relevant papers on the session topic which included the compact set-up for a fishing pier and market in Brixham and an interesting quayside layout with sawtooth profile in Esbjerg. Little had been written on maintenance however, especially maintenance dredging problems but it was hoped that there would be some interesting discussion on this subject.

Martin (UK): Said he was engineer-custodian of funds in Scotland for construction and improvement of fishery harbours. One or two aspects of his work might be of interest. There existed in Scotland, quays constructed of steel sheet piling backed quite often by rather poor quality fill which had questionable durability. Were engineers at fault in allowing steel sheet piling to continue, knowing full well that when it failed someone else would have to deal with the problem?

The spacing of bollards and other quay items such as fenders and ladder systems was very important in a developing fishing industry with increasing vessel size. This point was unfortunately frequently ignored or treated with scant respect.

On dredging existing fishery harbours—the Department of Agriculture and Fisheries for Scotland owned two sea-going dredgers specially built for work in their fishery harbours. One was a grab dredger, the other a bucket dredger; the latter was now being replaced by a combined grab and suction dredger, as experience showed that this was a preferable combination.

Problems with concrete piles

Hamilton (UK): Spoke of the use of prestressed concrete piles. He had occasion to use them in a number of locations, though not with particular application to fishing harbours. Two factors emerged. They appeared to be unduly brittle when it came to driving through ground with obstructions. When this point was referred to the manufacturers they indicated that they had designed their piles to a certain bending moment. This, however, was not very comforting to the engineer who had to drive them in difficult conditions without damage.

On extending prestressed concrete piles—these were manufactured in factory conditions where steam curing was usually employed. But when they got to the site and were perhaps driven to depths greater than anticipated an extension problem arose. In that case the only choice might well be to extend by conventional reinforced concrete. A head or extension of much greater cross-section might then have to be incorporated, which might be a disadvantage.

In the design of small harbours in particular, and in the beaching of vessels on the open beach, the basic problem was the reduction of wave impact and effect. It was suggested that if Gifford's enquiries regarding beach landing were directed towards wave suppression as part of the approach for open beach landing, the result might also benefit those harbours where breakwaters were a very significant factor in cost.

In the professional football field a whole football ground could be lighted with very high and very intense lighting groups; the same applied in marshalling yards for railways. In small fishing harbours it was very often found that the buildings and approaches were planned adequately but the placing of lighting standards was not satisfactory.

Dredgers for maintenance

Stammers (UK): Agreed that suction dredgers were preferable for maintenance dredging. Materials to be taken out were normally granular or sedimented and suction usually proved cheaper and more satisfactory.

On lighting, it seemed we had now got away from attempting to use large group lighting systems, as in sports stadiums, and had gone back to smaller groups, mainly because of flexibility and shadow effects.

The experience of his own firm was that they usually tried to combine steel sheet piling with a design for obsolescence which, perhaps, was another factor that could be discussed. Normally this would be 30 to 50 years in tropical countries combined with cathodic protection. However, one had no control over efficient protection during the life of the installation, and this important point was frequently overlooked by the designer.

Scheiner (IBRD) had similar experience with prestressed piles being too hard and cracking from time to time. Research on the frequency of vibration had been carried out and it was found that by varying it with the driving resistance and the speed of the hammer cracking of the piles could often be avoided. He thought there were some ready-made systems for the extension of piles, which were built in to the design where the pile could be prolonged every three or four metres the moment the critical area was reached. A Swedish company had also built some extended piles, built on a Belgian post-tensioning system, which were prestressed units, post-tensioned outside if they had to be prolonged. But in practice the best advantage could be obtained from prestressing if a prestressing bed was right on the site.

Regarding maintenance, it was easier for any port authority to get, say, a million dollars for new construction than $10,000 for maintenance. It was very difficult for port engineers to overcome this reluctance and almost to try to bluff a certain maintenance budget into the general budget. Authorities should understand that "a stitch in time saved nine" and proper funds for maintenance could save much expenditure.

In naval dockyards or commercial ports with adequate maintenance budgets cathodic protection worked quite satisfactorily but in remote fishing harbours it was not a logical solution.

Use of caissons

Osborn (UK) said that he had recently been involved in an investigation into the possibility of using caissons as breakwaters for a small port and this, in fact, proved to be the most economical in their estimates, although the question of the prepared foundations was introducing an extra cost factor. He was interested in caisson breakwaters that had recently been constructed in Japan using prepared foundations of rubble fill and similar types of material. During the war, caissons had been used as breakwaters at the Normandy landings and were settled immediately on the sand bed. It was understood that in those conditions very little settlement was recorded. It was also considered that caissons might be worth considering for breakwaters on unprepared beds, providing one accepted settlement. There was the possibility of scour but this could generally be overcome by providing some external riprap alongside the caisson.

On dredging, he believed that Norwegian engineers had experience of dredging boulder clay with dipper dredgers. This problem existed in Scotland and the use of normal bucket or grab dredgers was generally unsuitable because of the very stiff nature of the clay. It was in some cases virtually impossible unless additional means such as drilling and blasting was also used, but this was also frequently ineffective.

On the extension of prestressed piles, a sleeve clamped to the pile by means of epoxy-resin mortar bedding between the two faces had been planned for one project.

Proper handling of piles

Guckian (FAO) commented on the use of, and damage to, prestressed piles. In the cases described there must have been some lack of coordination between engineer and manufacturer. Piles could not be bought off the shelf just like nails, they had to be designed to meet specific criteria and one of these was their resistance to driving stresses in the conditions applicable to the site. Lack of adequate site investigation information might well have contributed to the damage and loss. Driving by applying force or pressure at the toe of the pile might also reduce this form of damage. Driving in this manner could be utilized in certain types of hollow piling but of course could not be generally applied.

As regards extension to the prestressed piles, there were of course, many prestressed and reinforced concrete piling systems which catered for this. In this connection the bayonet-jointed Swedish Hercules type piles, which were driven section by section, were specially mentioned. The sections were each about 2 m long. Several small and large diameter tube section piles of British and American design were other forms which catered for this. If foundation conditions determined by site investigations indicated very variable strata for pile termination levels making economical assessments of pile lengths difficult or impossible, then one of those forms of pile could be an acceptable solution.

On Osborn's assertion that it might be possible to use caissons for breakwaters without preparing their beds, this would be a most dangerous method due to the possibility of riding on obstructions and consequential damage leading to probable complete failure of the unit unless site investigations indicated no obstructions were present. However, the design of a caisson with skirting which incorporated jetting rings for equalizing settlement in non-cohesive materials might prevent damage in many circumstances. Even this would not be satisfactory in boulder-strewn or hard beds without very careful foundation preparation.

Van der Waard (Netherlands) said that when the extension of piles was foreseen mild steel rods of about 2 m in length could be incorporated as reinforcement on the top, and from those the piles could be increased in length. They could also take the pull for which the piles had been designed. The system had been in use for a long time. There were also piles equipped with a central steel cable which could be post-tensioned. These piles were very often used where there were very big pulls on the piles, for instance, in dry docks where the floor was prevented against uplifting by a form of anchorage or by piling which took high stresses.

Timber for economy

Hurst (Canada) commented on the type of construction materials available. The use of native timbers could often be helpful in small structures for small fishing harbours. This type of timber would last approximately 15 to 20 years in Canada and was relatively cheap. In many cases the material was available close to the site and the community could also benefit from the harvesting of the wood. Timber could not be used where there was heavy parasitic growth in the water such as teredo. Pressure-creosoted timber could usually last up to 35 years without maintenance costs, however, in these conditions. In less exposed areas in Canada the use of floating breakwaters had proved effective, the design depending on wave length and height. There had been quite a bit of experimentation in the shapes and types of materials which could be used. One of the most effective and economical systems was that of old barges anchored where there was some other protection. It was considered that up to a depth of about 25 ft considering the availability of material a rubble mound break water was probably the cheapest and most effective type. In deeper water, of course, different solutions like concrete cribs had to be considered. The use of perforated concrete crib developed by the National Research Council of Canada had been effective but, because of its sophistication, a considerable amount of time and effort had to be spent in terms of model studies and design costs.

Dredging of sand and silt was always a problem in areas where there was a maintenance problem. One of the difficulties was in the location of the spoil disposal area. It had been found that, if care was not taken, the same material might find its way back into the channel because of currents that were not noticeable on the surface but which might exist close to the bed of the harbour or channel. This might happen particularly where fresh water was flowing into salt water, resulting in density currents.

In river areas and fully developed areas where there was no spoil disposal area for suction dredges the use of the ocean-going dredge proved to be the most economical and effective way of getting rid of the material.

There had been some problems in Canada with steel sheet pile construction, particularly in areas with a high tidal range. In the Bay of Fundy there was one harbour where the tidal range was about 30 ft and the rate of corrosion was very high. Steel sheet piles were corroded about three-quarters of the way through within five years. Cathodic protection did not seem to be of any use in that area.

Whiteford (UK) said in respect of lighting of harbours, it should be borne in mind that when planning layouts of lighting for the smaller harbour it was ill-advised to go for too intense a level, particularly near the entrance, where a dazzle hazard would be most dangerous.

In the smaller fishery harbour, especially when all the vessels had been unloaded, it was found that the quay surfaces were frequently covered with a maze of ropes. In those conditions it would be better for the bollards to be installed close to the quay face and at close spacing so that each vessel could tie up more or less individually to a bollard.

Value of breakwaters

Seo (Japan) replying to a query on the use of caissons in Japan said that it had been the general finding of engineers engaged in fishing port development that in deep seas, breakwaters can be economically constructed using caissons. However, at places where foundations were weak it had been found that the improvement of the foundation was an essential prerequisite for the use of caissons. This improvement had frequently been done by displacement or sand drain methods.

As far as the filling of caissons was concerned, of course it was better, for the sake of stability of the structure of the breakwater, to use concrete for filling. However, to make it more economical to construct smaller ports it was in most cases the practice in Japan to use sand or rubble for filling caissons for breakwaters.

They had also found that upright breakwaters, especially for small ports, were more economical. They must be constructed with damping blocks at the front or outside of the breakwater. A great variety of forms of blocks had been developed and the damping effect had been found to be quite successful.

Heyer (Federal Republic of Germany) described his experience with prestressed piles. At one site there had been a choice for pile foundations: either steel piles or prestressed concrete piles. For reasons of corrosion it was decided to use prestressed concrete piles. Round hollow piles with 75 cm diameter and 12 cm wall thickness were used. A previous speaker had said that in the case of prestressed piles there was great danger of destruction and that this danger was not always recognizable. It was discovered in that project that destruction could be eliminated if the appropriate design and concrete quality were chosen and driving carried out with a heavy tool. The destruction of the piles was reduced to a minimum where with more than one thousand piles only ten were damaged and this damage could be located very clearly because the ramming of the piles had been followed very closely.

SESSION VI

The New Fish Auction Hall at Esbjerg

by J. Kjoergaard

Esbjaerg: La nouvelle criée aux poissons

La rationalisation et la reconstruction complète du port d'Esbjaerg, entreprises ces dernières années, a comporté notamment la mise en place, en 1966 et 1967, d'une nouvelle criée, d'une superficie d'environ 8,100 m^2, qui remplace la halle de vente en bois de 3,200 m^2 construite en 1924 et agrandie en 1931.

La nouvelle halle présente par rapport à la criée traditionnelle plusieurs innovations importantes. Pour accroître le nombre de postes, on a prévu des débarcadères qui découpent le quai en dents de scie, les navires de pêche accostant ainsi en diagonale. On accède à la halle, d'une largeur de 32 m et au sol entièrement libre, par un étroit corridor séparé par un mur suspendu de la salle principale. Dans celle-ci ne seront employés que des chariots et tracteurs à propulsion électrique. Pour que les gaz d'echappement des véhicules à essence ou à diesel ne puissent contaminer le poisson en pénétrant dans la halle de vente, un puissant groupe extracteur aspire l'air par une bouche qui s'ouvre dans le plancher au-dessous du mur suspendu, au bout du corridor d'accès. La criée est suffisamment vaste pour que les prises de 36 navires puissent être débarquées, triées et vendues pour midi. Dans la halle, le déchargement et le déplacement des produits de la pêche a lieu par transporteurs électriques à courroie. Les bacs utilisés sont en matière plastique de couleur blanche, et leur nettoyage se fait à la machine. Le bâtiment est la propriété des autorités portuaires, qui assurent son entretien et son nettoyage. Les deux crieurs agréés qui dirigent le débarquement, le tri et la vente du poisson sont des négociants privés. Les bacs appartiennent à l'Association des pêcheurs d'Esbjaerg, qui s'occupe également de leur nettoyage. Après la vente, les acheteurs se chargent de faire enlever le poisson. La halle de vente, y compris les deux bureaux situés aux extrémités, a coûté KRD 4,800,000 ($ E.-U. 635,000).

La nueva sala de subastas de pescado de Esbjerg

Una característica de la profunda racionalización y reconstrucción del puerto de Esbjerg que ha venido realizándose en los últimos años ha sido la construcción de una nueva sala de subastas del pescado en el puerto pesquero en los años 1966 y 1967. La superficie que ocupa la nueva sala es de 8.100 m^2 aproximadamente; sustituye a la sala de subastas de madera de 3.200 m^2 que se construyó en 1924 y 1931.

La nueva sala se diferencia bastante de las salas de subasta acostumbradas. Para aumentar el número de atracaderos se han construído frente al muelle plataformas de desembarque de forma triangular. El muelle ha adquirido un perfil de sierra con estacionamientos diagonales para las embarcaciones pesqueras. Con objeto de que el pescado colocado en la sala no se contamine con el humo expulsado por los vehículos movidos por petróleo o con motores diesel, la sala, de 32 metros de anchura, que carece completamente de columnas, se ha dividido en una sala principal y en una galería de tránsit más estrecha, mediante una pared de suspensión. En la sala principal se autoriza solamente el empleo de camiones y tractores eléctricos, con lo que los gases procedentes de los vehículos accionados a petróleo y con motores diesel que circulan por la galería de tránsito no entran en la sala principal; un potente sistema de extracción y ventilación aspira el aire de la sala principal y de la galería mencionada hasta un tubo de extracción situado en el pavimento por debajo de la pared de suspensión. La disposición de la sala es tal que a mediodía, 36 embarcaciones pesqueras en total han podido descargar, clasificar y vender los productos que transportan. Para descargar y transportar el pescado a la sala se emplean correas transportadoras. Una máquina lavadora automática limpia las cajas de plástico blanco que se emplean en la subasta. La sala es propiedad de las autoridades portuarias que se encargan de su entretenimiento y limpieza. Dos subastadores autorizados, que son comerciantes privados, se encargan de desembarcar, clasificar y vender el pescado desembarcado. Las cajas que se usan en las subastas pertenecen a la Unión de Pescadores de Esbjerg, la cual se cuida también de su limpieza. Los compradores se encargan de llevarse el pescado desde la sala de subastas. La nueva sala, incluyendo dos locales para oficinas situados en sus extremos, ha costado 4.800.000 coronas danesas (635.000 dólares).

ONE feature of the thorough rationalization and reconstruction of the port of Esbjerg which has been in progress over the last few years is the replacement of the fish auction hall built in 1924 and 1931 by a new and larger hall. The old auction hall covered an area of approximately 16 by 200 m (53 by 656 ft). The area covered by the new hall is approximately 32 by 255 m (106 by 841 ft), and at each end is built a two-storey office building. The total floor space of the two office buildings is approximately 930 m^2 (1,107 yd^2). The new hall is used exclusively for fish for human consumption, mainly cod and flatfish (plaice, sole, etc.), which is brought into the port, and iced. In 1965 approximately 30,000 tons of fish, to a total value of approximately D.kr. 60 million ($780,000), was brought into the old auction hall. In 1968 the amount of landed fish had dropped to approximately 25,000 tons, to a value of only approximately D.kr. 32 million ($326,000). The reason for this has been falling sales possibilities for Danish fish in foreign markets. The fish brought into auction is almost exclusively sold for factory filleting. The Esbjerg auction hall is consequently used in a way which differs somewhat from the use made of the auction halls of the North Jutland fishing ports where approximately 80 per cent of the landed fish is herring for human consumption, which is packed in boxes aboard the fishing vessels.

MARKET HALL LAYOUT AND FACILITIES

For fish to be filleted it is of great importance that it is not dried out and that it is not contaminated by exhaust gas from motor vehicles, or in any other way. This factor was considered in designing the new hall. The new hall is divided by a wall suspension into a kind of main hall and a narrower traffic corridor. The sorting of the fish takes place in the main hall, the gates of which are kept closed as far as possible during unloading. The hall is designed so as to make it particularly suitable for modern unloading equipment, such as conveyor bands, trucks, etc. The provision of such unloading equipment is the responsibility of the users of the hall (auctioneers, the Union of Esbjerg

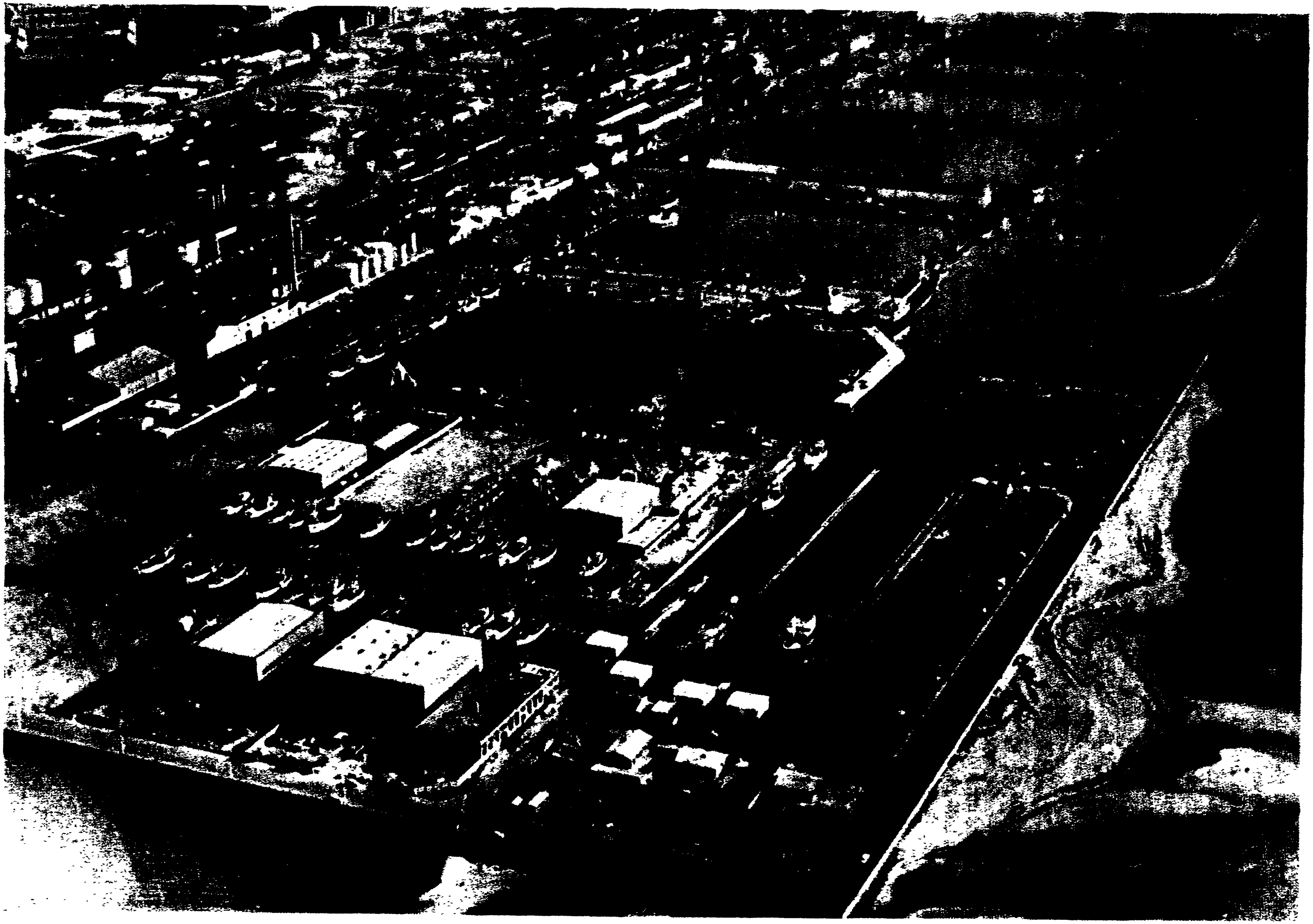


Fig 1. General view of Esbjerg fishing port

Fishermen, the Association of Esbjerg Fish Exporters).

The port authority, in co-operation with the users of the hall, has drafted the rough design for an unloading plant, which is shown in the drawings. This plant is designed so that fish unloaded is carried by conveyor band through apertures in the gates of the hall to sorting tables placed inside the hall. The ice used for icing the fish aboard the fishing vessels is, after the sorting, carried on a special ice conveyor band out to the harbour basin. At the old auction hall all sorting took place in the open air on the quay in front of the hall. From there the sorted fish was carried into the hall, the gates of which were open while unloading was in progress. As mentioned before, it is of great importance for the quality of fish that it is not contaminated by exhaust gas from vehicles. Consequently, the hall is equipped with a very powerful extraction and ventilation plant which conducts the air from the main hall and the traffic corridor to an extraction duct in the floor below the wall suspension between the main hall and the corridor. In the main hall proper the use of electrically powered vehicles only is anticipated. In the great majority of foreign auction halls the use of petrol and diesel powered vehicles is prohibited. Such a prohibition has not yet been introduced in Denmark, but will most likely be within the next few years, and, therefore, it was taken into consideration. The fish, after sorting is placed in spaces the sizes of which are determined so that it is possible to accommodate the cargo of two fishing vessels opposite to the same unloading berth. For this reason the width of the hall is dimensioned so that a total of 36 fishing vessels, corresponding to the normal number of vessels notified on peak days (Mondays and Fridays) can have their cargoes unloaded, sorted and sold by 12:00.

The fish is removed as soon as possible after sale, and the loading onto lorries is made by fork lift trucks. As these have to manoeuvre very quickly the hall is designed entirely without columns. When all fish has been taken away after sale, the hall is cleaned in the afternoon and the cleaned and empty auction boxes are placed in the spaces indicated by dotted lines. A semi-automatic box washing machine made by the German firm of Franz Hebold K.G., Cuxhaven, is used for cleaning empty boxes. The capacity of this machine is 350 to 550 boxes per hour. The machine is owned by the Union of Esbjerg Fishermen who clean the empty boxes which also belong to the Union. At the moment the stock comprises 6,000 60-litre white plastic boxes which, when filled to capacity, hold approximately 40 kg of fish each. It is expected that a total of 16,000 to 20,000 boxes will have to be acquired for the new hall. Prior to designing the new hall very careful studies of Danish, German and Dutch auction halls were made. An unloading plant somewhat similar to the one shown in the drawings was seen in the fishing port of Kiel.

To give the new hall sufficient capacity it has been necessary to make it 55 m (181 ft) longer than the old hall. The new hall is about 255 m (841 ft) long.

To replace the old port and customs guard-building (ousted by the new structure) a new port and guard-building has been erected in the western end of the new hall. In this building are telephone boxes and toilets. At the eastern end is another building housing a kiosk, toilets and telephone boxes, which has offices intended for letting to establishments connected with the auction hall. The first floor is thus specially arranged as offices for auctioneers. There has been no need to establish common rooms and welfare rooms for the hall workers as a modern welfare building was erected on the site immediately behind the old auction hall in 1959 to 1960.

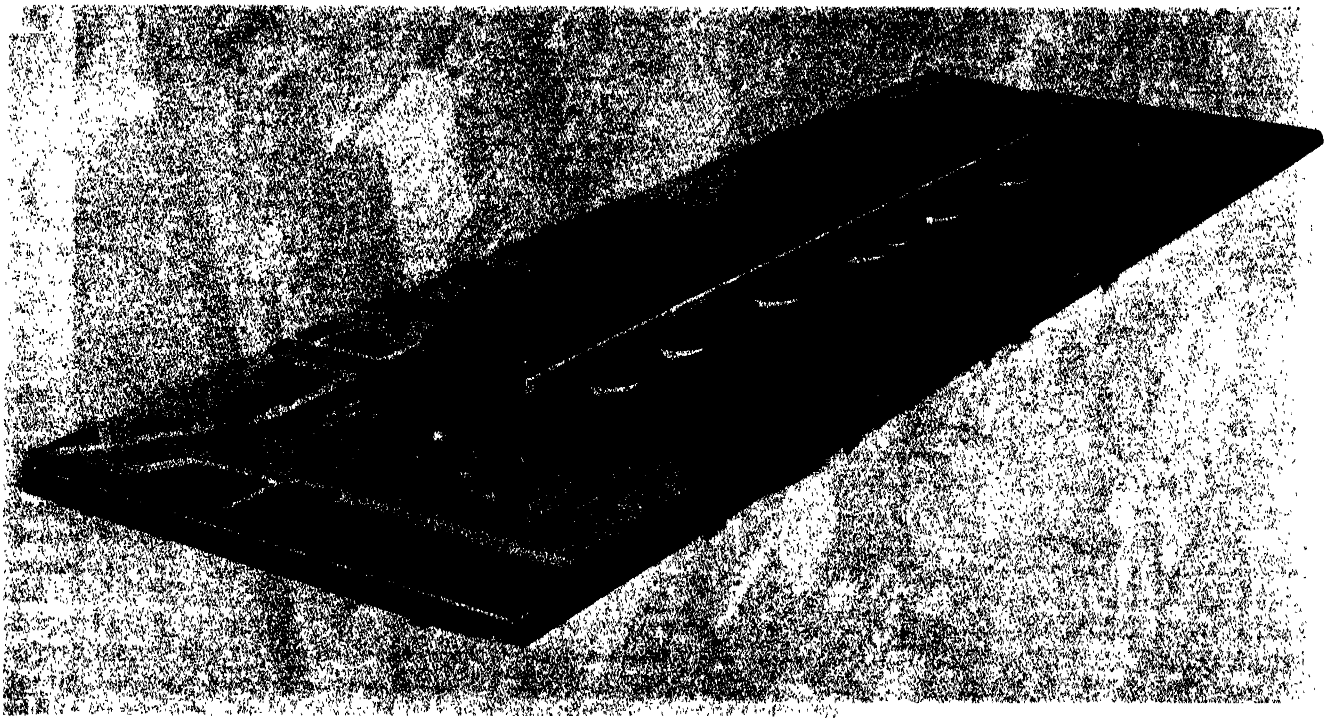


Fig 2. Model of the new fish market. Esbjerg

QUAYSIDE LAYOUT

The new auction hall is on the site of the old. Because of cramped space it has been necessary to build a new wharf about 17 m (56 ft) in front of the old quay and the old auction hall. The quay wall is made of interlocking steel sheet piles on the Frodingham system. The wall is clamped to 26-metre (76 ft) Larssen IPE sections which have been rammed down at an angle of 45°.

To increase the berth capacity triangular landing stages have been constructed in front of the quay wall. The quay has thereby been given a saw-tooth profile ("diagonal parking"). The increased berth capacity is between 40 and 55 per cent in relation to a linear quay. By this profile it has been possible to accommodate 18 vessels. At the old hall there was room for about ten.

Such shaping of a quay as far as we know, has not been attempted before. The system has several advantages, *inter alia* that the berths of fishing vessels have been exactly fixed in relation to the gates and unloading equipment of the hall irrespective of vessel size. Thus a very urgent need of users has been met.

The system is not ideal where sizes of fishing vessels vary much (as is the case in most of the harbours in the north of Denmark) but the Esbjerg fleet, which now comprises about 370 vessels in all, is very uniform. Most of the vessels are between 40 and 55 gross registered tons, and very few reach 80 gross registered tons or more. Those that do, are mainly used for industrial fishing, these catches being landed in basins 4 and 5 of the fishing port where there is special handling equipment.

If the size of fishing vessels should change materially, or if perhaps permission should be granted for unloading of fish caught by big foreign trawlers, the landing stages can easily be removed as they are constructed as prefabricated wooden stages which are clamped to the sheet-piling frame by bolts. Only tropical timber is used for the stages. The piles are of basralocus. The supporting parts of the construction are partly iron sections, partly Azobé timber. The plank covering is of jarrah.

CONSTRUCTION OF MARKET HALL

The hall is constructed entirely from prefabricated concrete sections. The roof girders are pre-stressed concrete girders. The wall sections are made with uncovered concrete on the outside. On the inside they are to a height of about 3 m (10 ft) covered by unglazed, light ochre coloured 2.5 by 5 cm (1 x 2 ins) Mettlach Streif mosaic tiles. This type of wall covering is to a certain extent the result of experiments carried out in other auction halls in Denmark where trials with different wall coverings have been made. It has proved easiest to keep clean from fish slime and dirt.

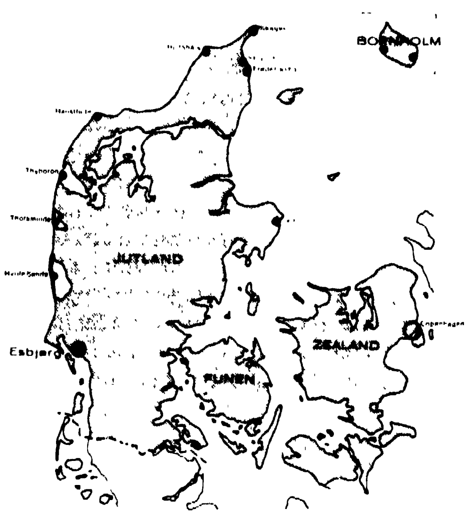


Fig 3. Principal Danish fishing ports

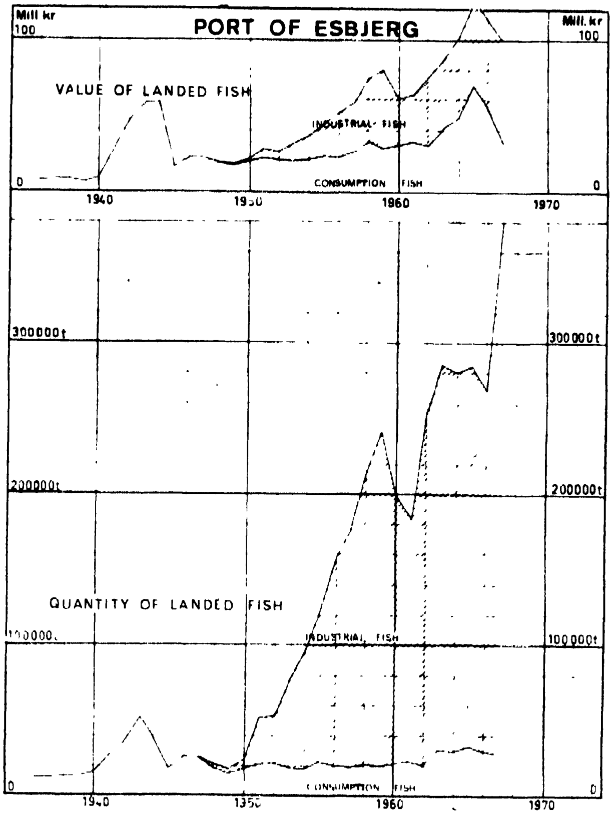


Fig 4. Tonnage and value of Esbjerg landings 1940–1970

The flooring is made of asphalt. It consists of a 25 cm (10 in) rigid gravel base on top of which is spread a 12 cm (4.7 in) layer of hot-mix, which was used as a working surface during the construction of the hall. When the installation work inside and outside the hall was completed and the damage to the hot-mix layer sustained in the course of the installation work had been repaired, the hot-mix layer was covered with 80 kg per m^2 (210 lb per yd^2) of asphaltic concrete with 1.2 mm broken granite. Before the flooring was put on, the subsoil was compacted to a depth of 80 cm (31 ins) to at least 100 per cent standard-proctor. The floor is designed with a gradient of about 20 per mille towards gutters at both sides of the hall. The gutters are covered with heavy gratings so that the floor is completely even, which is of great importance for the fork lift traffic.

PROGRAMMING OF WORK

As it has been necessary to have ten unloading berths constantly available during the construction of the hall the work was divided into three stages. While the construction of stage one was in progress ten unloading berths were available at the old hall. While stage two was being executed there were six berths available at the old hall and four berths available at a temporary auction hall which was erected on the area behind the shore wharf of basin one of the fishing port. While stage three was being completed there were six berths available at a temporary auction hall on the pier between basins four and five of the fishing port and four at the temporary auction hall at the shore wharf of basin one.

That it has been possible to carry out the work as described by means of temporary auction halls in such relatively short periods of time is due partly to the choice of wharf design. With the chosen clamping of the sheet-piling frame it has been possible for the fishing vessels to go behind this frame and lay to at the quay outside the old hall both during and after construction of the frame. The detailed planning of the work was executed according to PERT programmes.

Costs

On 4 February, 1966, a public examination of tenders was held, and the construction work was completed in April 1968. The total contract sum amounted to D.kr 5,894,230 ($765,000) for the construction of the new wharf as well as the new hall including the end buildings. The price for the execution of all work in connection with the construction of hall and end buildings amounted to a total of D.kr. 4,880,000 ($635,000). If the price for the end buildings is deducted, the costs towards the construction of the auction hall alone, inclusive of the extraction and ventilation plant with the wall suspension between the main hall and the traffic corridor, amount to a total of D.kr. 470 per m² ($72 per ft²). Exclusive of extraction and ventilation plant etc., the construction price amounts to about D.kr. 435 per m² ($67 per ft²). Preliminary

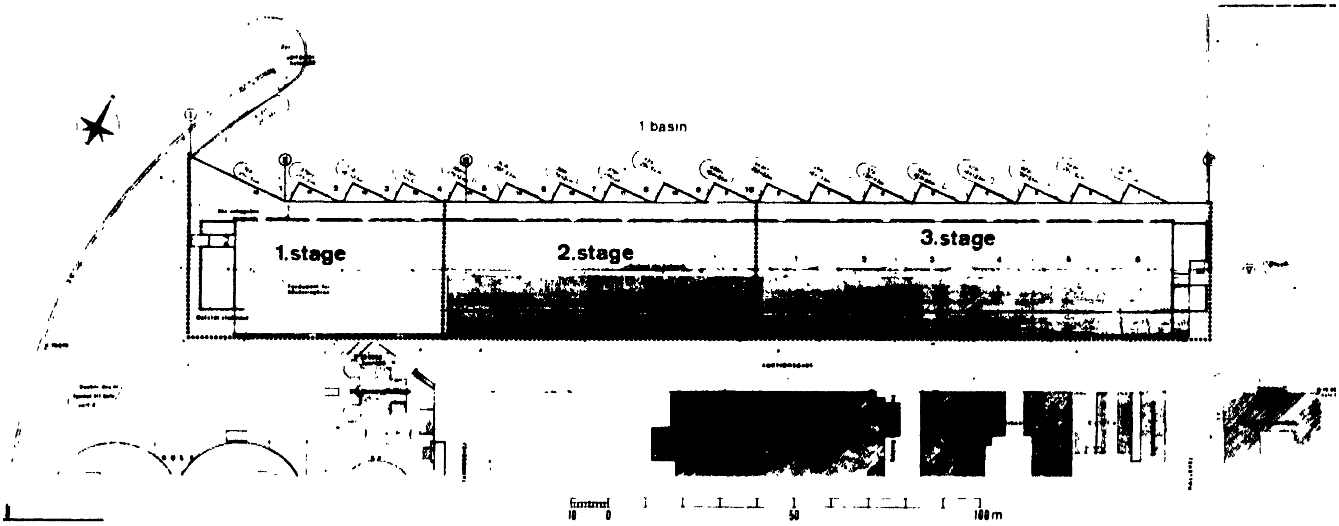


Fig 5. Plan of the new and old auction halls at Esbjerg, showing the three building stages

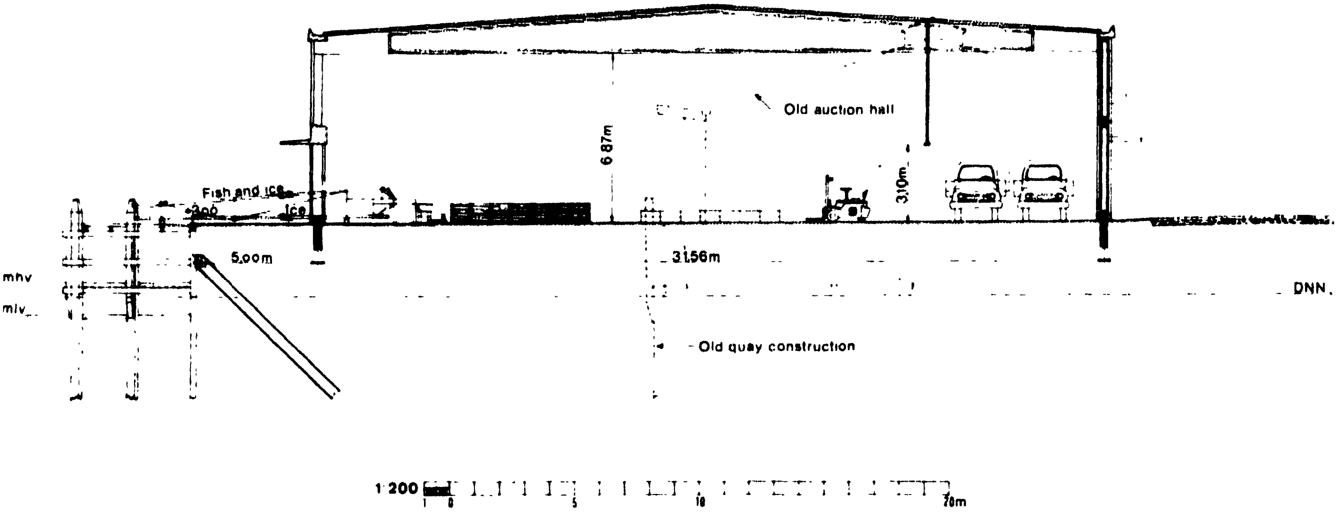


Fig 6. Cross-section comparison of new and old Esbjerg auction halls

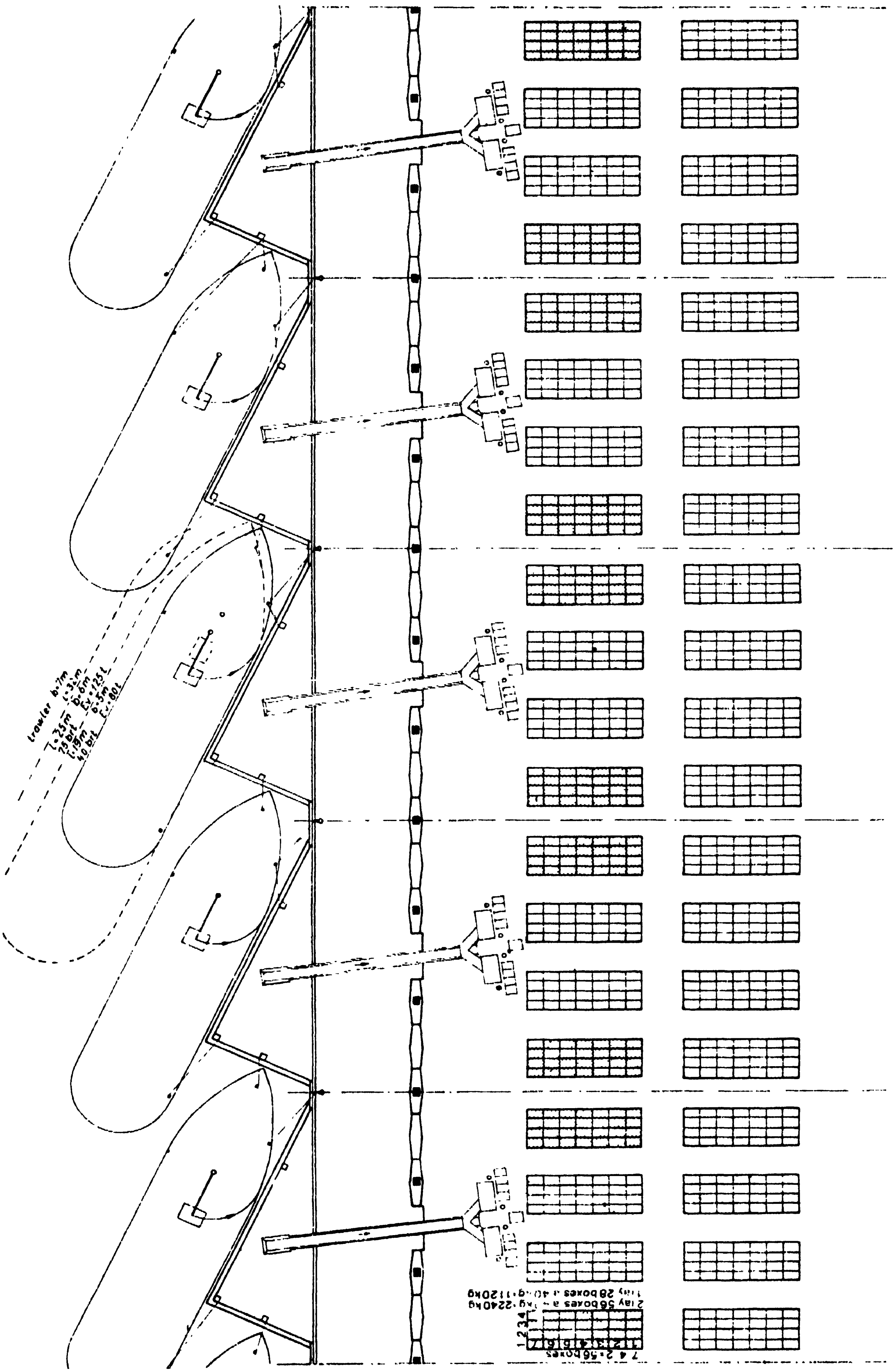


Fig 7. Ground plan of unloading facilities at Esbjerg

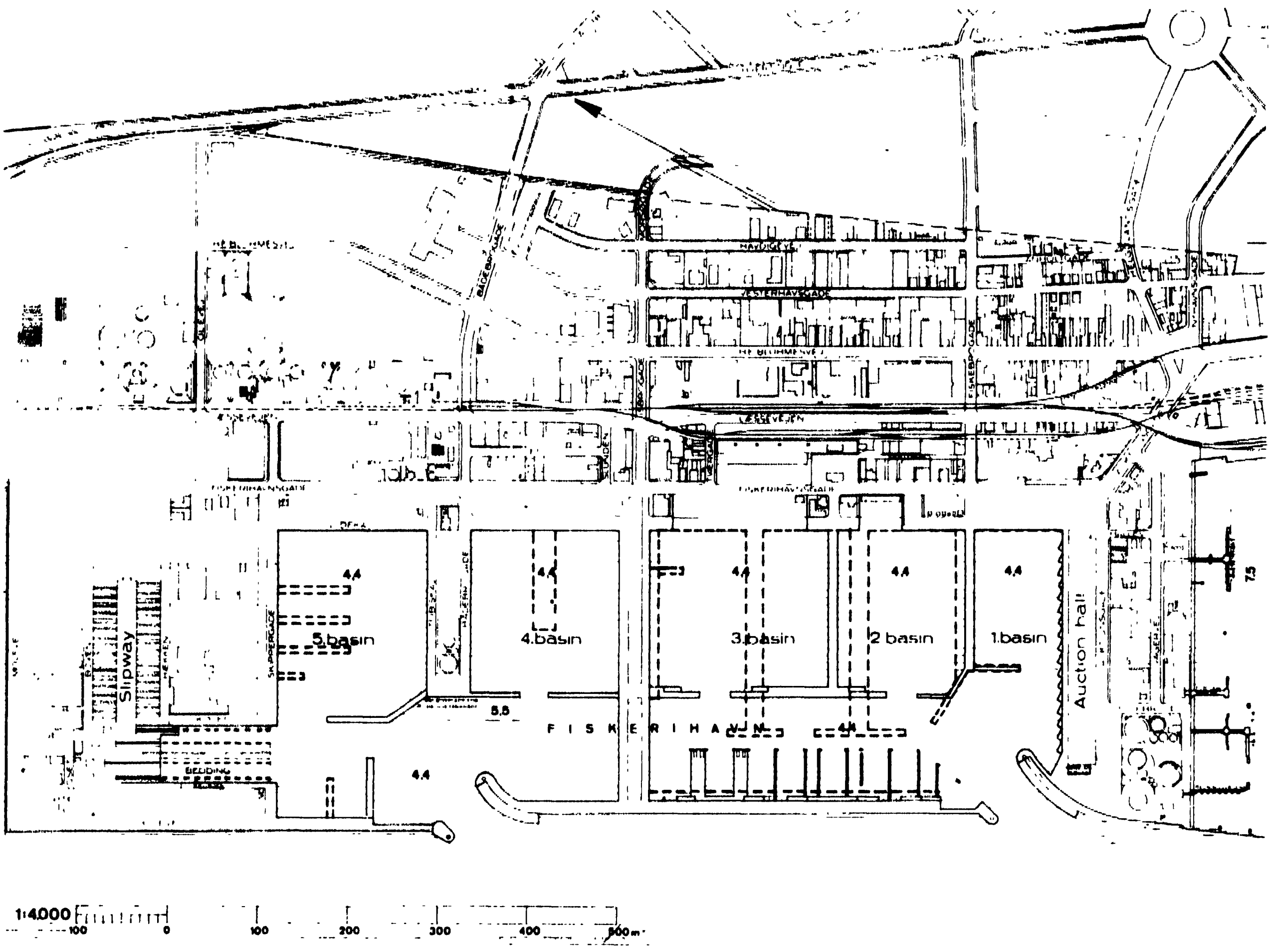


Fig 8. Plan of the fishing harbour at Esbjerg with proposed new piers shown as dotted lines

examinations, the preparation of a functional analysis, rough designing of the hall and rough and detailed designing of the new wharf etc., were made by the port authority's own engineering office. The architectural designing was supervised by architects, and the installations, etc., for the new hall were designed by consulting engineers.

ORGANIZATION AND MANAGEMENT

The new hall, now completed and in use, was built by the port authority. The port authority undertakes maintenance and cleaning of floors, walls, etc., lighting the hall, heating of office buildings etc.

The working expenses of the port authority, inclusive of interest and depreciation, are expected to be approximately D.kr. 450,000 ($58,000). For the use of the hall the fishermen pay ½ per cent of the value of the fish brought into the hall (hall charge). In 1967 this charge amounted to approximately D.kr. 150,000 ($20,000) which thus does not cover the working expenses of the port authority, but in addition to the hall charge, the fishermen also pay 2 per cent of the value of the landed fish by way of harbour fee. Part of this income is included in the account to reduce the working deficit.

Discharge of fish from vessels and its sorting is carried out by unskilled workers employed day by day. They are taken on by two auctioneers, who are also in charge of the sale of the fish. The auctioneers are independent, licensed tradespeople. They collect payment for the fish sold and pay the fishermen, but before the money is paid out, the harbour and hall fees are deducted. This money is paid to the port authority. In addition, the wages for unloading and sorting workers, amounting to about 3 per cent of the value of the fish, and the auctioneers' own fees about 2 per cent, are deducted.

For the use of the auction boxes, which are the property of the fishermen's own union, approximately ½ per cent is retained, and for a foundation for fishermen's widows is retained 1.5 per mille.

Removal of the sold fish is undertaken by buyers, who at Esbjerg, mainly consist of fish exporters or the fillet factories. Buyers who do not have lorries of their own have their purchases collected by haulage contractors. The auction boxes are used by buyers for transporting the fish and when empty they are returned to the hall where they are cleaned and stacked ready for further use.

In Esbjerg no company has been established for executing the many functions in connection with working the hall (cleaning, discharge and sorting, sale, transport (internal as well as external)), cleaning of boxes, etc. These functions are divided, which often gives rise to problems, especially in establishing a modern and rational internal transport system in the hall. The Port of Esbjerg Authority has for many years urged the establishment of an auction hall company to take care of the many different functions, but so far this has been impossible. The maintenance of order in the hall is carried out by a uniformed hall master who is appointed and paid by the port authority. He directs the fishing vessels to their berths as they enter the harbour, and he fixes the times of the auctions in co-operation with the auctioneers.

The Planning of Market Halls in Fishing Ports

by T. Yano and M. Noda

Conception des halles de vente des ports de pêche

Seul un agencement approprié des diverses installations annexes peut permettre aux ports de pêche de bien fonctionner. Parmi celles-ci, les halles de vente constituent l'élément de base pour le rassemblement et la distribution des apports de produits de la pêche et l'exécution de la fonction économique du port de pêche.

La communication expose une méthode d'établissement des plans des halles de vente des ports de pêche.

Il convient tout d'abord de tenir dûment compte des caractéristiques fondamentales tant des salles de vente que du port, et de fixer un ordre de priorité dans le temps.

Deuxièmement, il faut étudier les conditions dans lesquelles les apports peuvent être manipulés et les divers emplacements possibles, tant au stade initial que durant les périodes ultérieures. On détermine ensuite, en se fondant sur ces estimations, le type et la taille des installations que semble requérir la halle de vente.

Troisièmement, sur la base des éléments mentionnés ci-dessus, on dresse un premier plan de la halle de vente, et, compte tenu des liaisons devant s'établier entre celle-ci et les installations annexes, on relève les éventuels inconvénients que présenterait son application.

Les auteurs concluent en décrivant les installations de débarquement du port de pêche de Shiogama, qui constituent un bon exemple d'une halle de vente japonaise et de son organisation.

El proyecto de las lonjas en los puertos pesqueros

Sólo es de esperar que los puertos pesqueros funcionen debidamente cuando sus distintas instalaciones y servicios se hallen instalados del modo adecuado. Entre estas instalaciones y servicios las lonjas constituyen una parte básica y esencial para la recogida y distribución de las capturas del pescado y para el mejoramiento de la función económica de un puerto pesquero.

Este estudio presenta un método para proyectar las lonjas en los puertos pesqueros.

En primer lugar, al hacerlo, debe comprenderse, el carácter fundamental de las mismas o el de los puertos pesqueros así como las prioridades objetivas de los proyectos que han de prepararse.

En segundo lugar, se deben estimar las condiciones en que se pueden manejar las capturas de peces y las condiciones de emplazamiento, y examinar ambas cosas para el período proyectado y para períodos sucesivos. A continuación, basándose en estas condiciones preestimadas, habrá que determinar las clases de instalaciones y servicios que conviene crear dentro de las salas del mercado, y calcularse sus dimensiones.

En tercer lugar, basándose en los factores anteriormente mencionados, los proyectistas deben hacer un plano aproximado de las lonjas y, posteriormente, teniendo en cuenta las conexiones con las demás instalaciones y servicios, examinar los posibles inconvenientes que pueda presentar la ejecución de este plan.

Por último se presentan las instalaciones y servicios de los muelles del puerto pesquero de Shiogama, como ejemplo típico de salas de mercado en el Japón, y se indica también su trazado.

THOSE fish catches which are unloaded from fishing boats at a certain fishing port or those which are brought there by land, though the quantity of the latter may be small, undergo a series of processes such as sorting, washing, weighing, selling and packing in the market hall, and thereafter a part is sent to the consuming districts as fresh fish, another part to the factories for processing, and the remaining part to the refrigerators for preservation. In cases where the market hall is badly located, or its area is inappropriate, or where the interior facilities, such as water-supply system, container-storage, etc., are unsuitably designed or inconveniently arranged, smooth operation in the market hall cannot be expected. Moreover, such inappropriate handling of fish will often have a harmful effect on freshness and price of fish.

In designing a fishing port, it may be said that the formation of an appropriate plan for the market hall is an important factor in enhancing the economic value of such a port. Indeed it is clear that the market hall is the core of the land facilities in fishing ports.

Part 1

PLANNING CONSIDERATIONS

The functions of a market hall

The functions of the market hall, though varying somewhat according to local conditions, commonly consist of the following basic operations:

(a) Sorting, washing and weighing the unloaded fish catches in preparation for auction
(b) Display and selling the fish
(c) Packing and shipping the fish when sold.

Various facilities are required, and these facilities should be of an appropriate size and be so arranged as to be operated efficiently.

As a prerequisite to forming a plan meeting those requirements, the conditions under which fish catches may be handled, conditions of location, economic conditions, etc., at the objective time point of the project must first be grasped. Secondly, based on these estimated conditions, the size and arrangement of each of the facilities must be examined. Lastly, an all-round check-up must be made to ensure that the respective facilities are as a whole well balanced.

Economic aspects, such as the efficiency of investment in the hall, etc., are outside the scope of the present study.

Basic conditions

Consideration of such matters as the character of the market hall, the objective time point of the project, the method of handling (taking-in, auction, shipping) of fish catches and the conditions of the location of the market hall, is necessary.

It is of primary importance to define the character of the market, the requirements of the fisheries policy and the relations with neighbouring fishing ports.

The objective time of the project is the time representing the period of use of the facilities under consideration. In the case of long-term facilities, how to determine the objective time point of the project constitutes a very important factor. Failure to do so may result in the misuse of the facilities in congested conditions for the greater part of its service period, in spite of the huge cost involved in their construction, or having those facilities run under-capacity for a long period. The following minimum factors should be taken into consideration:

(a) The exactitude of techniques for estimating future values
(b) Years of life of the assets
(c) The financial circumstances
(d) The degree of technical innovation
(e) Custom and usage
(f) The degree of improvement expected
(g) Trends of increase or decrease in fish catches
(h) The credibility of statistical figures
(i) Balance with other facilities

In Japan, the objective time point of the market hall is generally scheduled about ten years ahead. This is because of the present limitations of techniques for estimation.

Handling fish catches. Factors involved may be summarised as in Table 1. These factors have a great influence on the size and arrangement of a market hall. The following points must also be considered.

(a) The fishing grounds and the state of fish resources at the objective time point of the project and thereafter
(b) Degree of technical innovation (e.g. fishery methods and processing)
(c) Trends in building of large-sized fishing boats
(d) An estimation of the distribution system of fish catches
(e) Trends in consumers' tastes in fish meat

TABLE 1. FACTORS INVOLVED IN HANDLING FISH CATCHES

Process of handling	*Factors*
Taking in	Species and quantity of fish, type of packing (in bulk (fresh or frozen), in container), state of taking in
In auction marketing hall	Form of display, method and frequency of auction, kinds of operations, operational efficiency
Shipping	Means of shipping (railway, road), quantity of fish, state of equipment of various related facilities

For the **location** the following should be considered:

(a) Whether or not there are sufficient areas for facilities for the project
(b) Where the area is not enough, whether or not the required area is obtainable by means of reclamation or other works
(c) The relations with neighbouring fishing ports
(d) The available transport facilities.

All the many factors concerning basic conditions ought to be examined at the initial phase of planning of the market hall. Therefore, the planner should study the whole plan of the fishing port itself.

TYPES AND SIZES OF FACILITIES

An appropriate market hall means one which meets the requirements arising from those various factors examined. The kinds of facilities to be installed there are as important as the size of the market hall itself. An excessive size or the installation of superfluous facilities may cause under-utilisation, subsequently resulting in waste, both of construction costs and in maintenance and control. In the reverse case, fishing boats may have to wait to land fish catches, or go to another port, resulting in unnecessary expense, inefficient disposal of catches, spoilage, disorderly operations in the market hall, and so forth.

TABLE 2. FACILITIES WITHIN A MARKFT HALL

Object of Service	*Function*	*Facility*
Fish	1. Handling of fish catches (sorting; washing; weighing; packing in ice; packing in case)	Preparation hall; storage yard for fish-boxes; ice-supply shop; water-supply facility (waterworks; pumping plant)
	2. Selling (lining-up of fish; bidding; auction)	Auction hall (fish catches display room; bidding room)
	3. Shipping (packing; temporary storing; loading; transport)	Packing and temporary storing hall; parking zone; truck-platform; truck-scale; automobile washing yard; warehouse for various cargo-handling gears
Fishing boats	1. Storing of fishing gear	Warehouse for fishing gear
	2. Communication and contact (with fishing boats)	Radio station (with complementary functions to inform on the conditions of the fishing ground and the market price of fish)
	3. Supply	Water supply for fishing boats; oil and ice supply facility; battery charging for vessels
Persons	1. Activities for public good and welfare	Lodgings; bathrooms; toilets; dispensary; shop (dealing with fishing implements for fishing boats and daily necessities); wash-stand
	2. Management and administration	Management office; watch-house; janitors' room; night-duty room
	3. Commercial transactions	Offices for personnel of fishermen's co-operative associations; middlemen; wholesalers; etc; conference-rooms; offices of various firms
	4. Communications	Telephone operation room
Others		Drainage and sewage disposal facilities; lighting and illumination facilities; sunshade and ventilation facilities; dumping ground; boiler room; reception room; machinery room

Kind of facilities to be installed

For a market hall to function efficiently, the necessary facilities are summarised in Table 2.

Some of these facilities are not always required, and some may be entirely omitted in consideration of the size and character of the market hall and the financial circumstances. On the other hand differences of customs and usages in other countries may necessitate facilities in addition to those listed. Therefore, the planner of the project must give careful consideration to these matters when he determines the kinds of facilities to be installed within the market hall.

The area of a market hall is the sum total of the area (Si) of each facility constituting the market hall, and therefore the total area (S) of the market hall can be given as the following formula:

$$S = \sum_{i=1}^{n} Si \qquad \text{(Formula-1)}$$

Accordingly, calculation of the total area of the market hall may be made by analysing each facility. Among the facilities mentioned, the fish handling hall is the most important component of the market hall, and the most troublesome in the calculation of its required size, because the boundaries of the operation area, aisles, fish display space, etc., are not well defined and often overlap each other in use.

Therefore, a brief explanation of the method for calculating the area of the fish handling hall is given. A fish handling hall mainly comprises the preparatory works hall, the auction hall and the packing and temporary storing hall.

Where the frequency of auction is definite and where all the fish catches allotted for one round of the auction are lined up in the fish handling hall, sold by auction, and then shipped from the hall, the area required may be calculated by the following formula:

$$S = \frac{NP}{R\alpha} \qquad \text{(Formula-2)}$$

S; Required area of the fish handling hall (m^2)

N; Quantity of fish catches scheduled for taking in per day (t)

R; Number of rounds of fish handling (round/day)

P; Required area per unit of fish catches (t/m^2)

The number of rounds of fish handling, herein referred to as R is related to the frequency of auction, and signifies the number of times per day the floor area of the fish handling hall is utilized on the assumption that the hall is fully utilized each time. P signifies the area of floor which is actually occupied by fish catches, and α signifies the ratio of the net area occupied by fish catches to the total area of the fish handling hall.

By way of example, the values of P in Japan are shown on Table 3.

TABLE 3. SPACE FACTORS (P) FOR DIFFERENT SPECIES OF FISH

Species of fish	*Type of packing*	P (t/m^2) *Scope of numerical value*	*Average*
Pollack, squid, mackerel pike	Cased (piled up to 10 cases high)	1.25–1.67	1.56
Mackerel pike	In bulk	12.0–17.8	14.9
Tuna	In bulk	12.0–14.0	13.0

The value of α varies much with the customs and conditions of handling fish catches in respective countries. When observing the ratio of the space actually occupied by fish catches to the total space of the fish handling hall, including the areas for aisles and pillars on the basis of data to hand, the value of α is 0.271–0.394 as far as the migratory fish such as pollack, squid and mackerel pike are concerned.

The auction-upon-occasion system. In this case, fish catches may be continuously taken in the fish handling hall without being limited in time. Therefore, the time-distribution of taking in fish catches, the starting time of the auction, the starting time of shipping out, the efficiency of operations, etc., are considered to have an influence on the size of the market hall. Accordingly, for the purpose of estimating what percentage of the quantity of fish catches scheduled for taking in per day should be handled at one time, it is convenient to map out a diagram showing the relation between the taking in and shipping out of fish as in fig 1.

The market hall in this case is required to have an area sufficient to handle at least the peak of stocks (maximum accumulation) at any time, and the area may be calculated by replacing N/R of Formula-2 with the quantity of the "peak of stocks at the market hall" shown in fig 1.

It is necessary to know how to estimate **the quantity of fish catches scheduled for taking in per day.** If we adopt the maximum value, during a year or best fishery season, the chances of full utilisation of the fish handling hall would be only once or twice a year. If we adopt the mean value, the fish handling hall would have to be used in a congested condition for a considerable number of days during a year. In either case, there will be problems. Therefore, as a means of deducing an appropriate numerical value, a "diagram of excess probability" is used (fig 2).

This method is intended to utilise the fact that the quantity of fish landed per day makes a logarithmic-normal distribution. In this method, a diagram of excess probability, as shown in fig 2, is first worked out on the basis of the data of the past business records and the acceptable quantity of input per day at the present position in time is determined by the diagram of excess probability, and the acceptable congestion, i.e. the frequency of occurrence of fish catches per day whose quantity exceeds the capacity of the hall. Next, on the basis of the numerical value thus obtained, the scheduled quantity of taking in per day at the objective time point of the project is deduced by taking into consideration the quantities of fish to be landed at the present and at the objective time point of the project as well as those other possibilities outlined earlier.

It is further to be noted that if the quantity of fish catches coming in by land is not large the scheduled quantity of fish catches per day is almost determined by the capacity of the quays where fish catches are landed.

A question which may be raised with regard to this method is what percentage of excess probability is to be adopted as allowable congestion. Generally speaking, it

Fig 1. Panoramic view of Shiogama fishing port

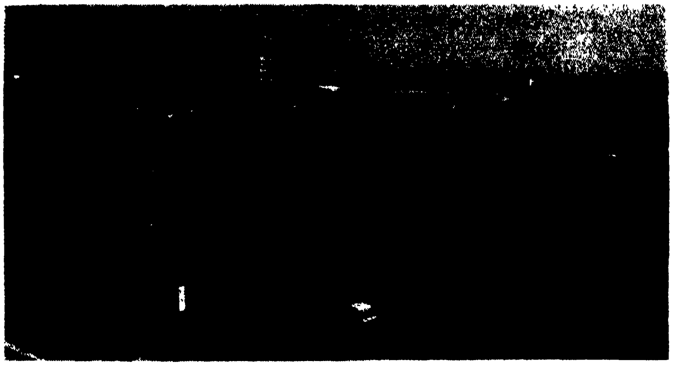


Fig 2. View of Shiogama fishing port shore facilities

will suffice to fix the percentage so that the total loss arising from the idle space allowed for the fish handling hall, and the various losses from making the said hall too small, will be at a minimum. However, this calculation is so complicated that in most cases the estimation of the said probability depends on the intuition of experience.

Width of the fish handling hall. Generally speaking, it is desirable that the fish catches taken into the fish handling hall be transported by the shortest course and time, without congestion; that is, by the course making a right angle with the quay. For this purpose, the load of one fishing boat should be disposed of within a fish handling area of a length less than the length of the boat. Also the related operations should be conducted at right angles to the quay. Accordingly, it is necessary that the width of the fish handling hall be determined by the larger of the following two measures:

(a) A length deduced from the quantity of catch per fishing boat, the length per boat and the fish handling capacity per unit of area

(b) The sum of the lengths required for the operations which are performed on fish catches within a fish handling hall.

Examination should be made regarding the spare area of the fish handling hall in relation to the envisaged increase or decrease in the quantity of fish handled.

ARRANGEMENT OF FACILITIES

The arrangement of facilities within the market hall should ensure as far as possible, the smooth flow of fish, people, automobiles, and so forth, inside the market hall as well as in front and behind it. For this purpose, it is necessary to analyse the flow of fish and automobiles, the inter-relation of activities at various facilities, and to examine the relation between the market hall and neighbouring facilities.

In order to move the catch as smoothly as possible, it is desirable to arrange the facilities so that they may be transferred in a constant direction without conflicting with the movement of trucks and cargo-handling gear. In addition, the goods should be sold and moved out of the market hall through as short a distance as possible.

However, if there are two or more channels of flow in the market hall (see fig 3), it is very hard for the planner

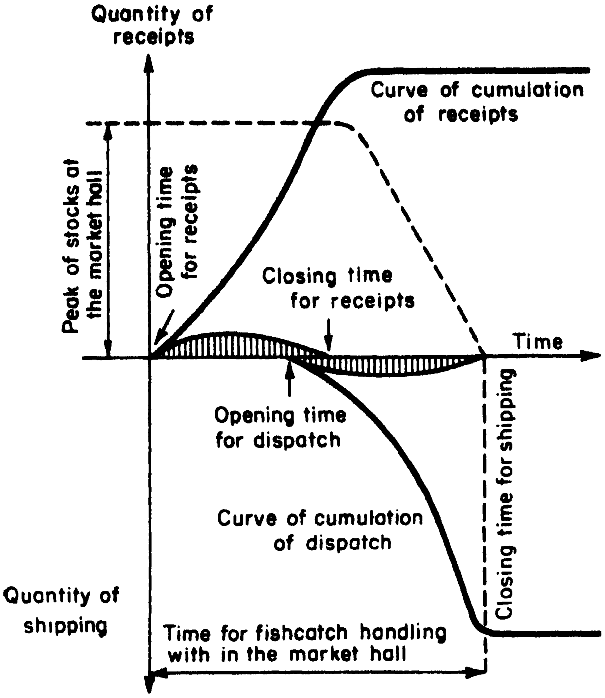
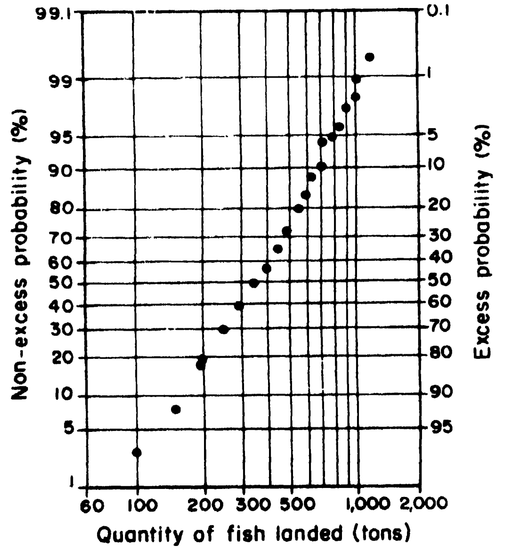

Quantity of receipts
Curve of cumulation of receipts
Peak of stocks at the market hall
Opening time for receipts
Closing time for receipts
Time
Opening time for dispatch
Curve of cumulation of dispatch
Closing time for shipping
Quantity of shipping
Time for fishcatch handling with in the market hall

Fig 3. Relation between receipt and dispatch of fish catches

to meet all requirements mentioned above. In this case preparation of an arrow-diagram, such as fig 3, is a very effective method of examining which flow is most essential. In this diagram, the quantity of the catch is signified by the thickness of the line.

For the purpose of arranging the facilities, all the names of facilities required, except those considered to be unrelated, are listed (fig 4). The mutual relations of those facilities are laid down by lines or colours according to the ranked degree of dependence. Then, with reference to the above-mentioned arrow-diagram, adjustments are made so as to minimize the crossing of such lines expressing high degrees of mutual dependence. Through such a process, an inter-relation diagram like fig 4 is obtained. Furthermore, where it is necessary to make the market hall multi-storied because of restraints on the area of land, etc., those facilities which are used mainly by human beings, or which are low-ranked in the closeness of their connection with the fish handling hall, are to be located on the second or third floor of the market hall.



(NOV.-DEC. 1963, FEB. & SEPT. 1964, OCT.-NOV. 1965)

Fig 4. Diagram of excess probability of quantity of fish landed daily at Shiogama fishing port

Upon determining the approximate inter-relation of facilities a rough plan is prepared embodying position and the estimated area.

The rough plan so prepared needs further review with regard to the aisles and flows of fish, automobiles and cargo-handling gear, while taking into consideration the location of the facilities other than the market hall, particularly the apron, parking zone, road, ice boxes and refrigerators, etc.

The individual movements of the fish, automobiles, cargo-handling gear, etc., is relatively simple. But these things are supposed to move around at the same time and, therefore, their movements, taken together, tend to be intricate. One flow impedes other flows and affects seriously the efficiency of fish handling and the safety of the working personnel. This is especially so in the following circumstances:

- (a) In the case where there is only one road leading into the market hall
- (b) Where automobiles are driven on to the apron
- (c) Where there is a railway service parallel with a road service
- (d) Where automobiles are driven into the market hall
- (e) Where there is a restraint on the location of the refrigerators, ice-boxes, parking zone, etc.

Besides the foregoing, the local customs and usages, and the conditions of location may give rise to various problems. To cope with the above problems, it is necessary to enter the movements of fish and automobiles, both on the inside and the outside of the market hall, in the rough plan which was provisionally prepared, and try to minimize the lines which cross each other.

ALL-ROUND EXAMINATION

The rough plan recommended in this treatise has been prepared independently of the numerous indefinite factors which may come into each phase of operations. Therefore, it is necessary to review at least the following points in detail:

- (a) The flow of human beings, trucks and freight cars in the neighbouring zones of the fishing port
- (b) The ability to meet future developments, or the scope for future expansion
- (c) The adaptability of the plan to eventual changes of circumstances.
- (d) The restrictions arising out of competition with other projects.

Besides the foregoing, there are other factors, particularly financial restrictions which limit the funds available for investment in the construction of the market hall. Such economic factors, however, have been omitted from this treatise, but due consideration has to be given them nonetheless when planning the project.

Part 2

SHIOGAMA FISHING PORT

This fishing port is located within Matsushima Bay, which constitutes the inner part of Sendai Bay, located in the northern part of the Pacific Coast of the main island of Japan. The coast in and around this fishing port is Liassic, and the mouth of the Bay is dotted with islets of various sizes which serve as a natural breakwater.

Off this fishing port, where a cold current joins a warm current, there is located a productive fishing ground. During the fishing season, many boats from all parts of the country flock into the area and operate there while utilizing Shiogama Port as their base. Shiogama serves also as the base for fishing voyages in northern waters, as well as the southern waters of the Pacific Ocean. This is indeed a primary fishing port of Japan (fig 5).

The species landed at this port range from codfish and flatfish caught by trawl in the northern waters of the Pacific Ocean, to bonito, tuna, mackerel pike and mackerel. The number of fishing boats using this port during 1966 was approximately 1,480, and the takings recorded during the same year were about $27,000,000 (115,000 tons in quantity) (fig 6).

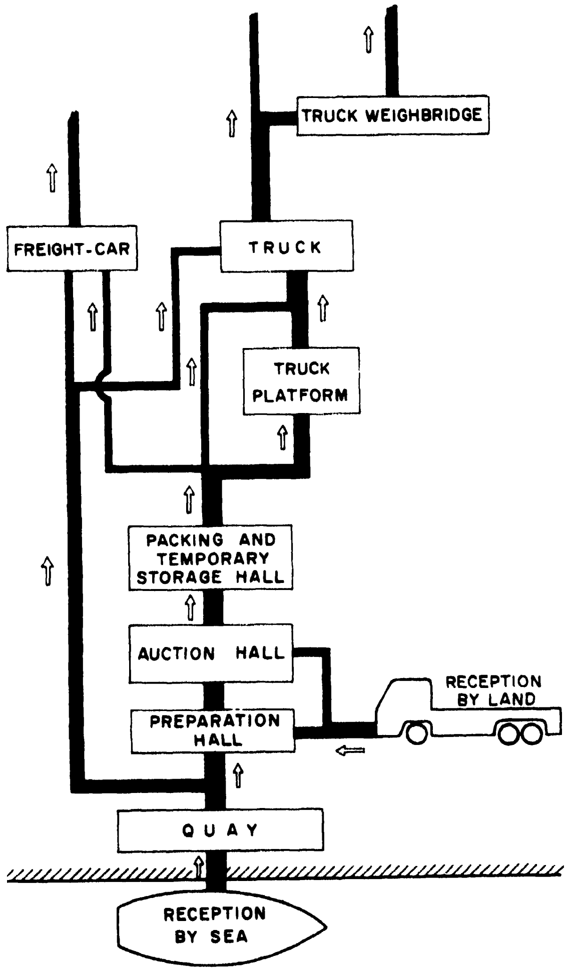


Fig 5. Flow diagram

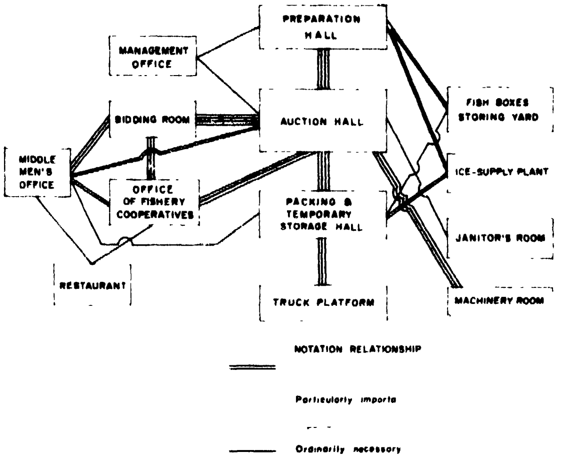


Fig 6. Interrelation of activities

Development works

Construction and repair work at Shiogama Port was first started in the 1870's for a commercial harbour and has continued further since then.

After the establishment of the Fishing Port Law in 1950, Shiogama Port was divided into commercial and fishing harbours. The facilities necessary for the fishing port were to be completed by means of the fishing port development provisions, and the development master-plan was worked out in 1951.

This plan materialized in the first and second Fishing Port Development Projects. Presently, the work in progress is based on the third eight-year Fishing Port Development Plan aiming at 1970 as a goal.

The construction of the market hall described below has been achieved as part of this work.

Outline of present project. This aims at the development of mooring facilities (including −2 × −6 m (19.5 ft) quays

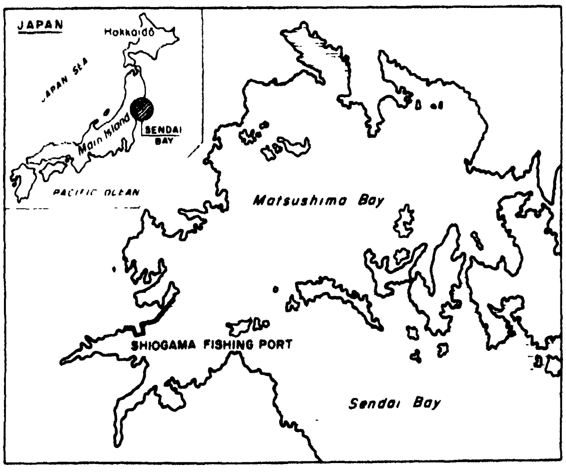


Fig 7. Location map of Shiogama fishing port

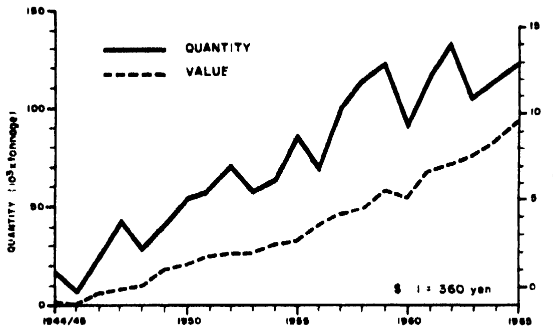


Fig 8. Quantity and value of fish landed at Shiogama

and piers) with a length of 1,400 m (1,500 yd) centring around the front of the market hall, to facilitate the arrival of chill freighters of the 3,000-ton class and to allow 20 fishing vessels of large and medium size to moor alongside and land simultaneously. Under this project a fish catch unloading area and the vessel landing area for small-sized fishing boats have also been constructed and are in use.

The development of various facilities required for efficient operation at this fishing port, including transportation facilities such as roads and railways, is also under way.

Apart from the above, but as a related project, the construction of a big composite fishing centre is scheduled after reclamation of 600,000 m² (718,000 yd²) of land in the adjacent area, to consolidate efficiently the related fishery facilities such as ice plant, cold storage facilities, refrigeration plant, and fish processing industrial group (fig 7).

PLANNING THE MARKET HALL

Basic requirements to be met are:

(a) Scheduled quantity of dealings per year; 14
tons

(b) Scheduled quantity of dealings per day; 720
(Excess probability; 9%)

(c) System of auction; auction-upon-occasion
tem

(d) Standard quantities of dealings in the fi
season **by the type of fishery** are as in Table

(e) Standard number of fishing motor-boats c
fied by tonnage operating per day in the fi
season are as in Table 5.

Calculation of the area of the fish handling hall

Hereunder, briefly explained, is the method of cal
tion of the area of the fish handling hall, which const
the heart of facilities within the market hall (Table

TABLE 4. STANDARD QUANTITIES OF LANDINGS BY FISHERY

Type of fishery	*Principal species*	*Type of packing*	*Standard rate of landing in the season*	*Standard quantity of landing per day in the season*
Trawling in the northern waters of the Pacific Ocean	Codfish, flatfish	Raw; in bulk	27%	195 tons
50 GT drag-rope tuna fishing	Tuna	Raw; in bulk	4%	27 tons
Dragnet fishery, by small boats	Flatfish	In container; single-layer	10%	72 tons
Mackerel pike fishing with scoop-net	Mackerel pike	In bulk	58%	416 tons
Others	Bonito, shark	In bulk	1%	7 tons
		Total	100%	720 tons

TABLE 5. STANDARD NUMBERS OF VESSELS BY FISHERY AND BY TONNAGE

Type of fishery	*Less than 3 tons*	*10–20 tons*	*20–30 tons*	*30–40 tons*	*40–50 tons*	*50–70 tons*	*70–100 tons*	*100–200 tons*	*200–500 tons*	*Total*
Trawling in the northern waters	—	—	—	—	—	7.1	1.5	1.5	1.2	11.3
Tuna fishing	—	—	—	—	0.2	1.1	0.9	1.0	0.3	3.5
Dragnet fishing by small boats	—	1.8	1.4	1.3	1.0	0.1	—	—	—	5.6
Mackerel pike fishing with scoop-net	—	0.3	0.5	6.4	1.2	3.4	5.0	2.9	1.1	20.8
Others	3.1	—	—	—	—	—	—	—	—	3.1
Total	3.1	2.1	1.9	7.7	2.4	11.7	7.4	5.4	2.6	44.3

Note: The decimal fraction results from adoption of the mean of numbers for ten days in the fishing season

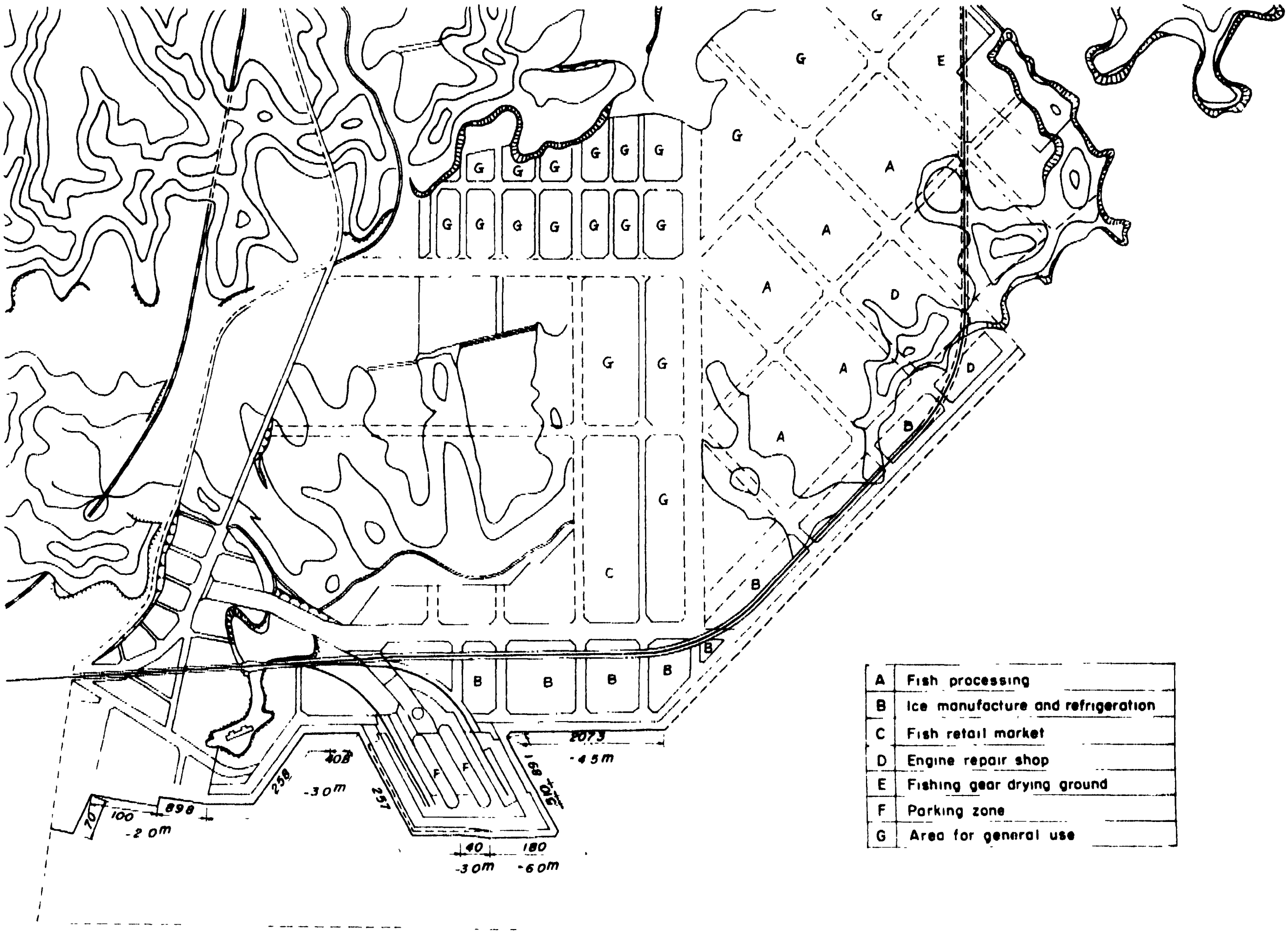


Fig 9. Plan of Shiogama fishing port

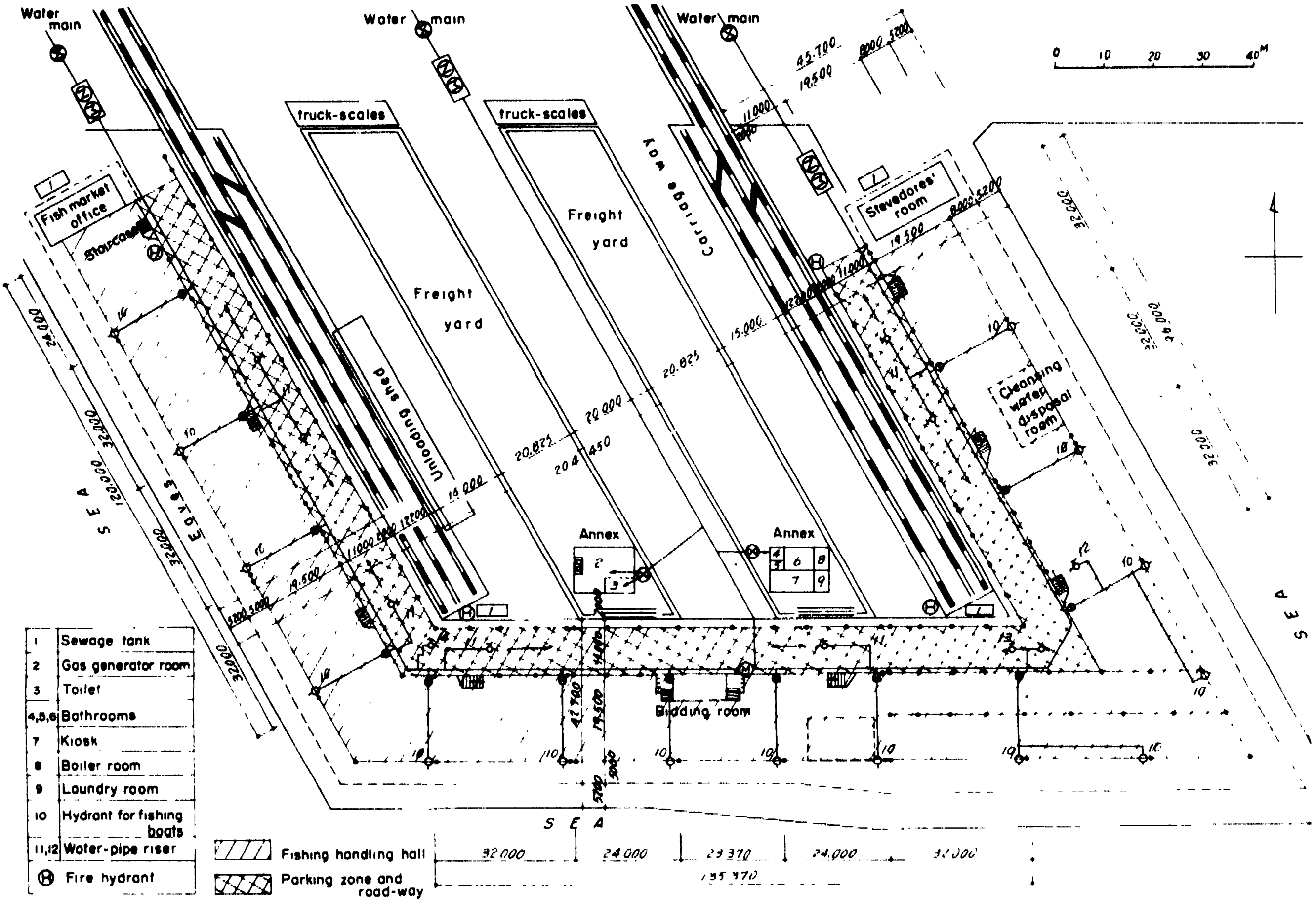


Fig 10. Layout plan of first floor of the market hall, Shiogama

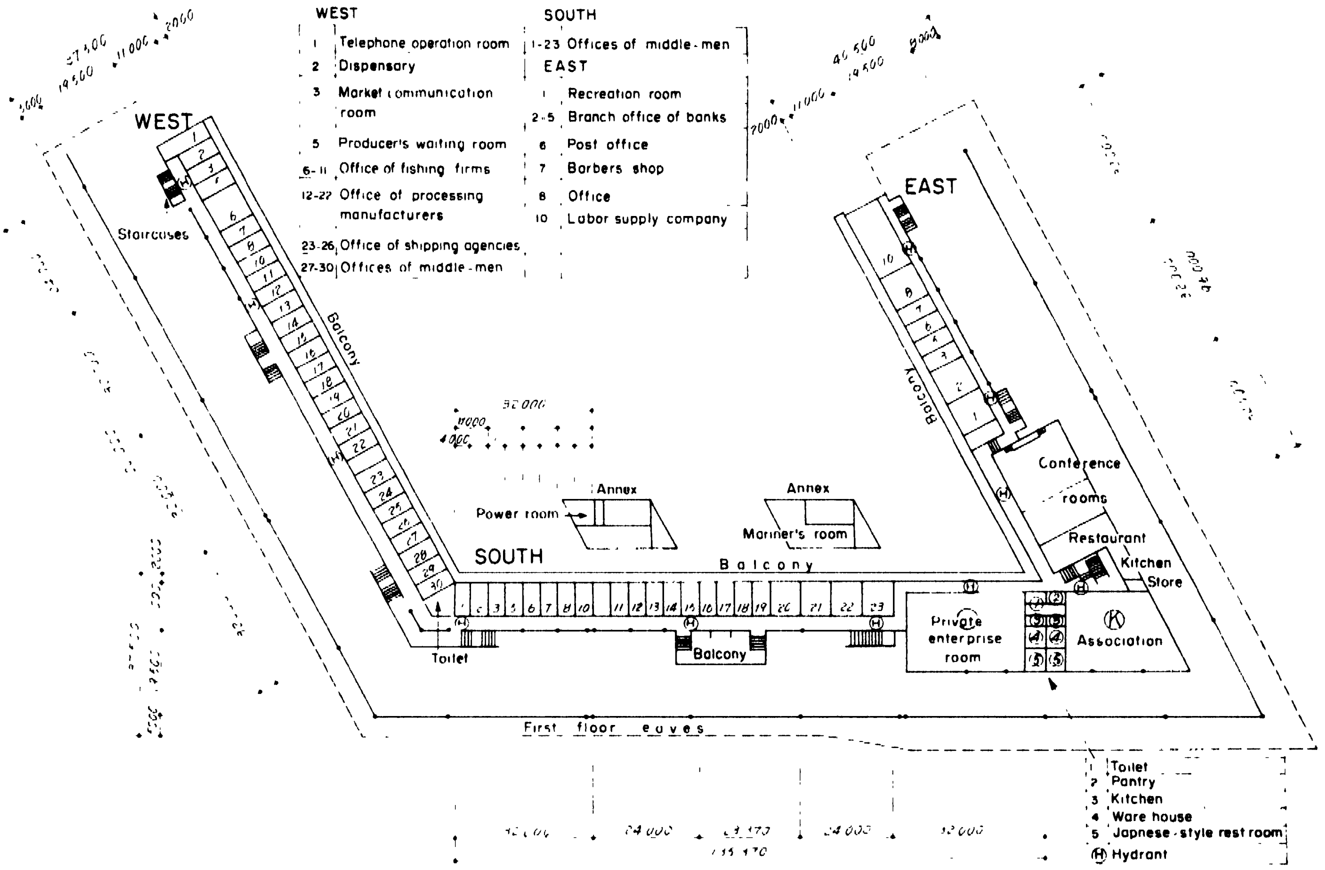


Fig 11. Layout plan of second floor of the market hall, Shiogama

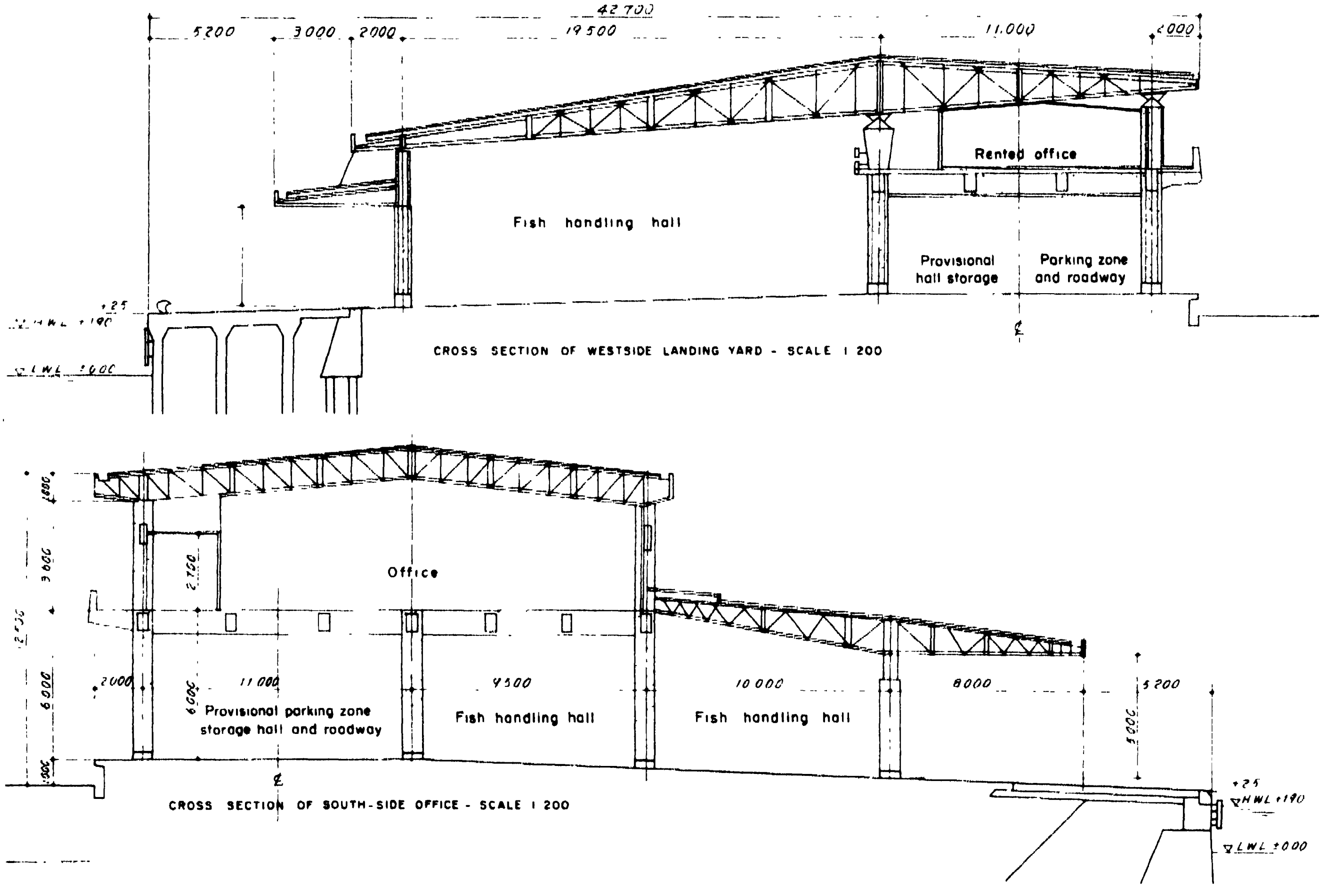


Fig 12. Cross-section of Shiogama fish market

TABLE 6. AREAS REQUIRED FOR MARKET DISPLAY BY FISHERY

Type of fishery	*Peak of stocks at the market hall*	*Required area per unit of fish catches (P)*	*1/Ratio of occupied area (1/α)*	*Required area*	*Remarks*
Trawling in the northern waters	40 tons	15 t/m^2	1/0.3	2,000 m^2	Variation of the values from those shown on Table III is because of the fish-cases not being stacked
50 GT drag-rope tuna fishing	6 tons	13 t/m^2	1/0.3	260 m^2	
Dragnet fishery by small boats	14 tons	15 t/m^2	1/0.3	700 m^2	
Mackerel pike fishing with scoop-net	84 tons	15 t/m^2	1/0.3	4,200 m^2	
Others	1 ton	15 t/m^2	1/0.3	50 m^2	
Total	144 tons			7,200 m^2	

TABLE 7. MARKET AREAS BY FACILITY

(a) Main building

No. of floor	*Name of facility*	*Area*	*No. of floor*	*Name of facility*	*Area*
1st		13,190 m^2	2nd	Corridors	965 m^2
	Fish handling hall	8,247 m^2	cont.	Kitchen, pantry, toilet	152 m^2
	Carriage way within market hall	4,150 m^2			
	Loading platform	702 m^2	3rd		33 m^2
	Bidding room	91 m^2		Theatre room	33 m^2
2nd		5,762 m^2	4th		127 m^2
	Rented offices (Civic departments 5, Financial interests 4, Traders concerned 48)	2,254 m^2		**Produce museum**	127 m^2
			5th		126 m^2
	Wholesalers' office	1,010 m^2		Observation platform	126 m^2
	Conference toom	462 m^2			
	Balcony	700 m^2	Total		19,246 m^2

TABLE 8. MARKET AREAS BY FACILITY

(b) Annexed building

Two-storied	Gas generator room, machinery room, wholesalers' room, power room with rest-room	390 m^2
,,	Boiler room, bathroom, laundry room, entrance, dressing room, kiosk, mariners' room	390 m^2
One-storied	Stevedores' room	204 m^2
,,	Fish market office	176 m^2
,,	**Freight handling shed**	448 m^2
	Total	1,607 m^2

Peak of stocks at the market hall = $720 \times 0.2 = 144$ (tons).

> (Examples in the past indicate that the ratio of the peak of stocks at the market hall to the quantity of fish landed per day is approximately 20 per cent in this port.)

In the actual planning, however, 8,200 m^2 (9,750 yd^2) were allotted for the area of the fish handling hall with a view to some allowance.

The area of various facilities calculated on the basis of the degree of utilization in 1964, and their standard value is shown in Table 7.

Arrangements of facilities

The arrangement of facilities determined in relation to the services required, the flow of fish catches and automobiles, and the inter-relation of respective facilities, etc., is as shown in fig 8 and fig 9.

The elevations of the main market hall building are shown in fig 10.

Le Nouveau Port de Pêche de Lisbonne

par P. H. de Carvalho Cunha

The new fishing port at Lisbon

This paper describes the conception and planning of the very modern fishing port of Pedrouços at Lisbon. The author first outlines the Government objectives in arranging for the construction of a new fishing port and then describes the location and the local circumstances, including transport, which prompted the choice of Pedrouços. The harbour works are explained and the author then proceeds to a detailed description of the installations of the port, the various services provided to the different classes of port user, and touches upon the responsibilities of the managers of the port, a consortium of the users of the port and market. The ice and coldstore facilities are detailed and the author then proceeds to a discussion of the planning of the very modern market hall at Pedrouços, explaining the factors which determined the interior planning of the hall. Particular attention was given to the circulation of both people and vehicles, and efforts were made to give the fish a constant flow from the quayside to the discharge points. The various associated facilities and administrative services are also described.

El nuevo puerto pesquero de Lisboa

Se describe en este trabajo la concepción y el diseño del modernísimo puerto pesquero de Pedrouços, en Lisboa. El autor expone, en primer lugar, los objetivos del gobierno al construir un nuevo puerto pesquero, describiendo a continuación el emplazamiento y las circunstancias locales, incluido el transporte, que indujeron a la elección de Pedrouços. Se explican las obras del puerto, continuando el autor con una descripción detallada de las instalaciones portuarias, así como de los distintos servicios que se proporcionan a las diferentes clases de usuarios; expone las funciones de los administradores del puerto, que es un consorcio formado por los usuarios del puerto y del mercado. Explica detalladamente las instalaciones de refrigeración y frigoríficas, pasando luego el autor a examinar el diseño de la modernísima sala del mercado de Pedrouços y exponiendo los factores que determinaron el diseño interior de la sala. Se prestó especial atención a la circulación de personas y vehículos, procurándose, sobre todo, que el pescado tuviera fácil salida desde los muelles a los puntos de descarga. Se describen igualmente las varias instalaciones auxiliares y los servicios administrativos.

NOUS extrayons les passages suivants du décret-loi n°. 40.764, du 7 septembre 1956, qui définit l'orientation du Gouvernement quand il a autorisé l'Administration Générale du Port de Lisbonne (AGPL) à octroyer, en régime de concession, le nouveau port de pêche de Lisbonne, à Pedrouços:

> L'objectif poursuivi consiste seulement à assurer une plus grande économie de l'exploitation de l'industrie de la pêche, conformément aux principes modernes de la rationalisation scientifique du travail, en jetant les bases d'une organisation commerciale de la manipulation du poisson, capable d'intensifier la production et la consommation, d'améliorer la qualité du produit et de réduire les prix.
>
> Le seul intérêt de l'Etat en la matière est par conséquent de favoriser le consommateur, en lui donnant la possibilité de disposer, au futur, de poisson, dans les meilleures conditions économiques, en bon état et en abondance.
>
> On ne pense pas non plus qu'il soit recommandable que l'exploitation soit effectuée directement par le port de Lisbonne; il semble bien plutôt préférable, étant donné que la rapidité indispensable à la manipulation économique du poisson ne peut se concilier qu'avec une administration du type commercial, de confier l'exécution du service à une entreprise.

Les nouvelles installations de pêche de Pedrouços ont été inaugurées en juin 1966, et seul y a été transféré le secteur de la pêche au chalut.

L'approvisionnement public en poisson provenant de la pêche hauturière au chalut est assuré par l'importante flotte qui, ayant sa base d'armement dans le port de Lisbonne, a une production estimée à plus de 80 pourcent du tonnage du poisson provenant de la pêche au chalut pour l'ensemble du Pays.

Les installations ont un développement considérable, en accord avec l'évolution constatée dans ce secteur de la pêche. Ainsi s'est justifiée la nécessité d'amplifier le dock de Pedrouços, et l'on a admis qu'il fallait procéder sans retard à l'amplification des installations frigorifiques d'emmagasinage du poisson congelé.

La rénovation des unités de la flotte de pêche et de l'équipement de cette activité économique, dotée de nouveaux moyens d'action, détermine la nécessité permanente d'ajuster les installations terrestres du port de pêche aux nouvelles exigences. A partir de l'année courante, la pêche au chalut disposera de ses cinq premiers chalutiers-congélateurs, ce qui correspond à une production annuelle de 30.000 tonnes de poisson congelé.

Quant aux pêches artisanale et à la sardine, le transfert de leurs installations terrestres à Pedrouços sera effectué à bref délai; les travaux maritimes d'adaptation du môle sud du dock, pour servir de quai de débarquement des embarcations de ce secteur d'activité des pêches, sont presque terminés. La valeur de la production de cette modalité de pêche accuse un rythme ascensionnel, conséquence également de la politique gouvernementale exposée plus haut.

Les installations terrestres, destinées à ces types de pêche, devront être terminées en 1969.

ENCADREMENT GENERAL DU PORT DE PECHE DE LISBONNE

La localisation, à Pedrouços, des installations de pêche du port de Lisbonne a été déterminée non seulement par des considérations spécifiquement portuaires, mais encore par la nécessité de les intégrer dans un système général de communications, dans la dépendance naturelle des schémas urbains établis pour la ville de Lisbonne et pour la "Costa do Sol".

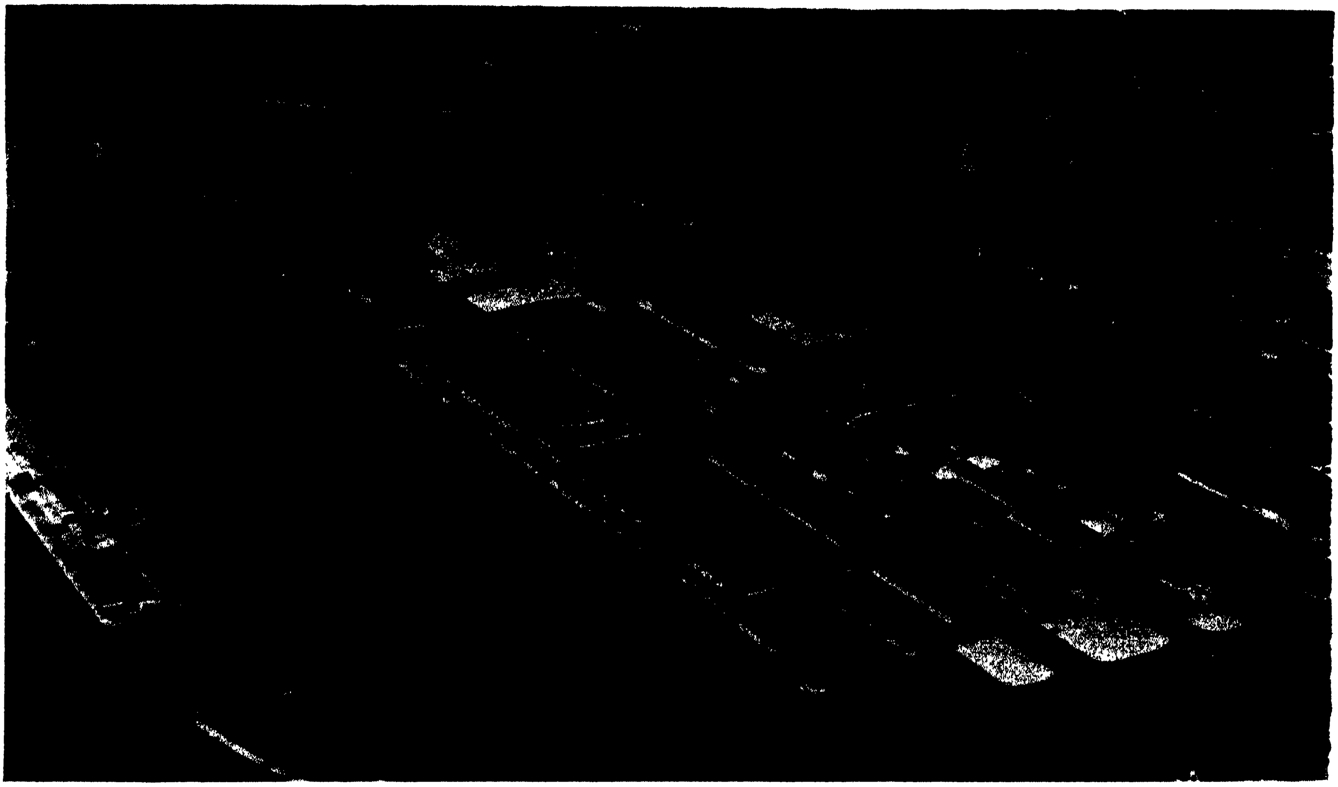


Fig 1. Vue aérienne du port de pêche—photo de 1965.
On voit les édifices en construction et les travaux en cours pour l'extension du bassin

Ainsi, l'écoulement des produits de la pêche s'appuiera sur la voie de circonvallation de la ville et sur la "Route Marginale" et ses prolongements. La première de ces artères enveloppe la capitale et permet l'accès facile aux marchés distributeurs, à partir de la périphérie vers l'intérieur, évitant ainsi la traversée, longue et inopportune, du réseau de circulation urbain. La seconde artère permet la distribution du poisson sur une étendue de grand développement urbain: "Costa do Sol", Sintra, etc., étant donné les conditions particulières d'habitabilité et l'intérêt touristique qu'offre cette région; son prolongement comme voie de pénétration permet de desservir le centre de la ville et les zones périphériques de son secteur est.

Le réseau ferroviaire national, par l'intermédiaire de la ligne d'Estoril, offre également des conditions propices pour la distribution territoriale du poisson. Bien que, dans la présente phase de réalisation, l'on ne prévoit pas, dans le plan général correspondant, la liaison du port de pêche au réseau ferroviaire, ces liaisons n'en sont pas moins assurées. Ce plan général, par les dispositions adoptées dans le tracé des artères et par le schéma étudié pour l'implantation des voies ferrées, garantit comme il se doit une bonne articulation entre les voies de circulation, avec les ouvrages maritimes et les édifices.

Fig 2. Vue Général du bassin; au premier plan la centrale du Froid

A la limite ouest de la commune de Lisbonne est prévue la construction d'un passage dénivelé pour la voie ferrée et l'accès aux installations de pêche.

LES TRAVAUX MARITIMES DU PORT DE PECHE DE LISBONNE

Le dock de Pedrouços, qui constitue l'élément-base du port de pêche de Lisbonne, a été construit avec les dimensions de 480 mètres de long (528 yd) sur 162 mètres de large (178 yd); il dispose d'un entrée de 70 mètres de large (77 yd). Il a été délimité, au nord, par un mur-quai à foundation continué, constitué par des blocs en béton simple, et fondés sur leur plus grande étendue, à une profondeur de 6 mètres (20 ft) au-dessous du zéro hydrographique du port de Lisbonne, autrement dit à la cote (−6,00) (−20 ft). A l'ouest, ont été installés initialement une rampe d'échouage et un plan incliné; au sud, le dock a été fermé par deux môles de 330 et 90 mètres de long (363 et 99 yd), délimités du côté du fleuve par des murs-quais fondés à la cote (−4,50) (−14.8 ft) et par des talus empierrés du côté intérieur. La

Fig 3. Façade sud de la halle de vente du poisson

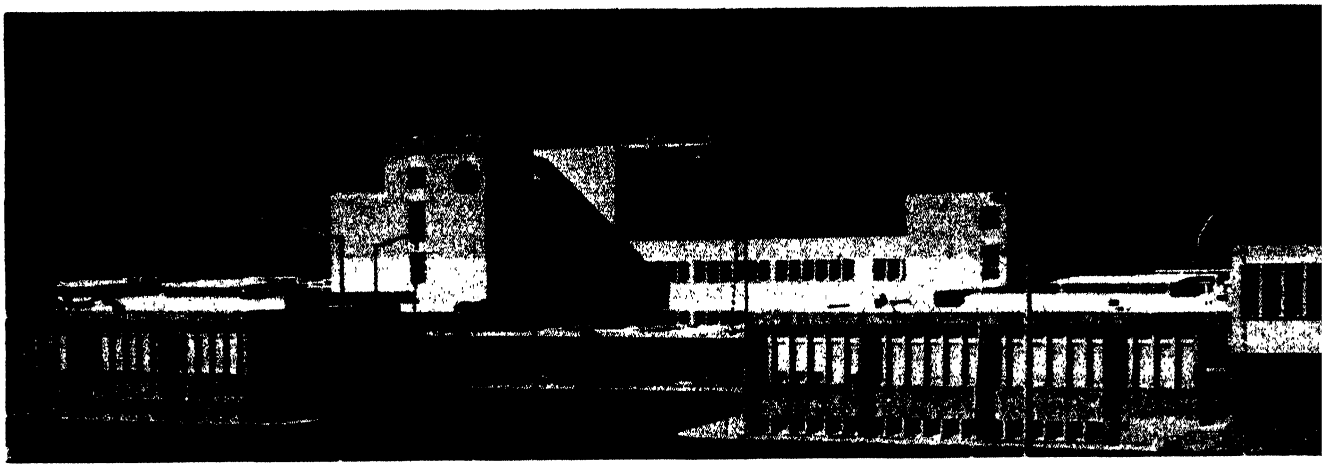


Fig 4. Vue parcielle de la Halle; façade nord du corps central

Fig 5. La criée, iluminée pour travail nocturne

superficie liquide du dock est de 60.000 mètres carrés (14.6 acres).

Le plan général du port de pêche de Lisbonne a fait postérieurement l'objet d'une révision, compte tenu des nouvelles exigences des opérations de déchargement du poisson et d'approvisionnement des flottes de pêche; on a abouti à la nécessité d'augmenter l'extension des quais et la superficie du bassin.

La longueur des mursquais utilisables a été éevée àl 680 mètres (748 yd), soit un accroissement de 90 pourcent par rapport à l'étendue accostable précédente; et l'accroissement de la superficie liquide du dock a été de l'ordre de 20 pourcent, élevant cette superficie à 90.000 mètres carrés (22.4 acres).

La continuité du schéma des travaux maritimes du port de pêche de Lisbonne a en outre exigé la construction d'un quai spécial pour le débarquement du petit poisson, de 300 mètres de long environ (330 yd), implanté à l'intérieur du môle d'aval du dock.

LES INSTALLATIONS TERRESTRES DU PORT DE PECHE

Le décret loi n°. 40.764, cité au début du présent travail, a défini les édifications qui pourraient être à la charge de l'AGPL et celles qui seraient construites aux comptes de l'entreprise concessionaire: la "DOCA-PESCA", Société Concessionaire du Dock de Pêche de Pedrouços.

Edifications à la charge de l'AGPL

Sont déjà terminés et sont entrés en fonctionnement les édifices suivants:

(a) Halle de vente du poisson
(b) Commerçants et Hygiénisation des Caisses
(c) Services sociaux
(d) Installations de la Garde Douanière
(e) Installations des autorités maritimes

Seront en outre construits les édifices suivants:

(a) Armateurs
(b) Services généraux
(c) Magasins généraux
(d) Criée à la sardine et pêche artisanale

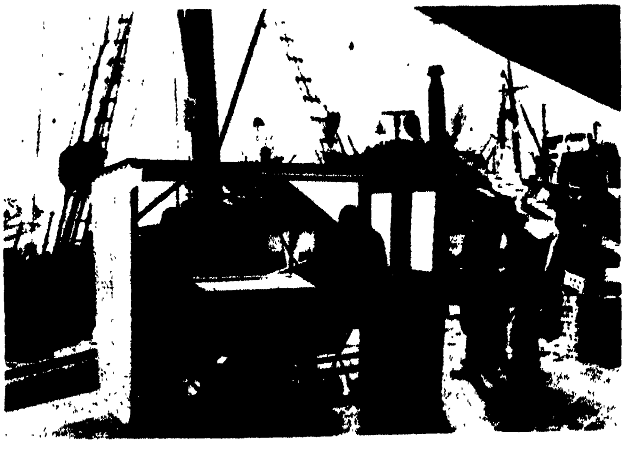


Fig 6. Déchargement du poisson

Parmi cet ensemble d'installations terrestres, c'est sans aucun doute l'édifice de la Halle de vente du poisson qui, par ses caractéristiques, son ampleur et ses installations techniques, occupe la première place. C'est pourquoi nous lui consacreront au n°. 5 du présent rapport, une étude détaillée. Quant aux autres édifices, nous en donnerons ci-dessous une brève description.

Edifice pour les commerçants et l'hygiénisation des caisses. Cet édifice, comme son nom l'indique, est destiné aux installations des commerçants, dont le nombre dépasse ceux qu'il est possible d'installer en contact direct avec la criée, et aussi à l'équipement approprié pour le nettoyage et la désinfection des caisses destinées à la manipulation du poisson.

A l'étage supérieur, et doté d'un accès facile aux installations de lavage, se trouve un vaste atelier de réparations des caisses pour la manipulation et l'expédition du poisson.

L'édifice est constitué par deux blocs distincts, disposition qui en permet l'intégration facile dans l'édifice de la halle, dont il dépend fonctionnellement.

Edifice pour les services sociaux. L'édifice des services sociaux comprend deux grandes zones: la première, destinée aux services médicaux (services d'urgence, accidents du travail, recours médical limité à un domaine restrein et inspections médicales); la seconde est réservée aux salles de réunion et au service des repas pour l'ensemble du personnel, non seulement du personnel travaillant àla criée, mais encore du personnel de pêche, de manière qu'il puisse jouir, en terre, d'une ambiance accueillante et confortable.

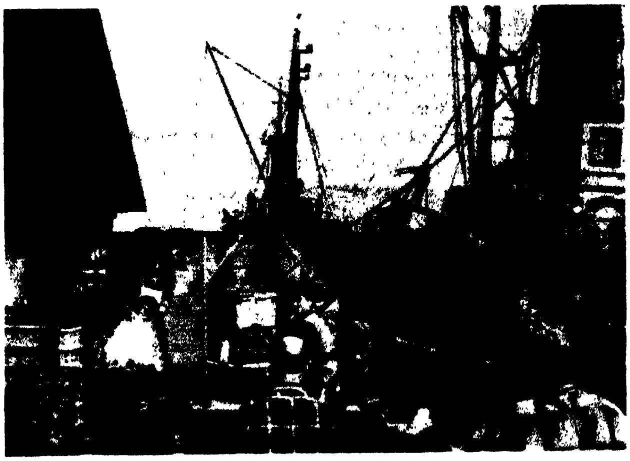


Fig 7. Nettoyage du poisson

L'installation a été projetée conformément aux dispositions de décret-loi n°. 40.764, suivant lesquelles la compagnie concessionnaire devait "entretenir et développer l'oeuvre d'assistance sociale déjà commencée, au bénéfice des travailleurs de la mer".

Edifice pour les services officiels. Sous cette désignation sont englobés les édifices pour les autorités maritimes, fiscales et de police.

Edifice des armateurs. Principalement destiné à l'entreposage des engins appartenant aux armateurs, ces installations sont de trois types: grand, moyen et petit dévelop-

Fig 8. Exposition du poisson avant la vente aux enchères

pement, suivant l'importance de l'activité de chacun d'eux.

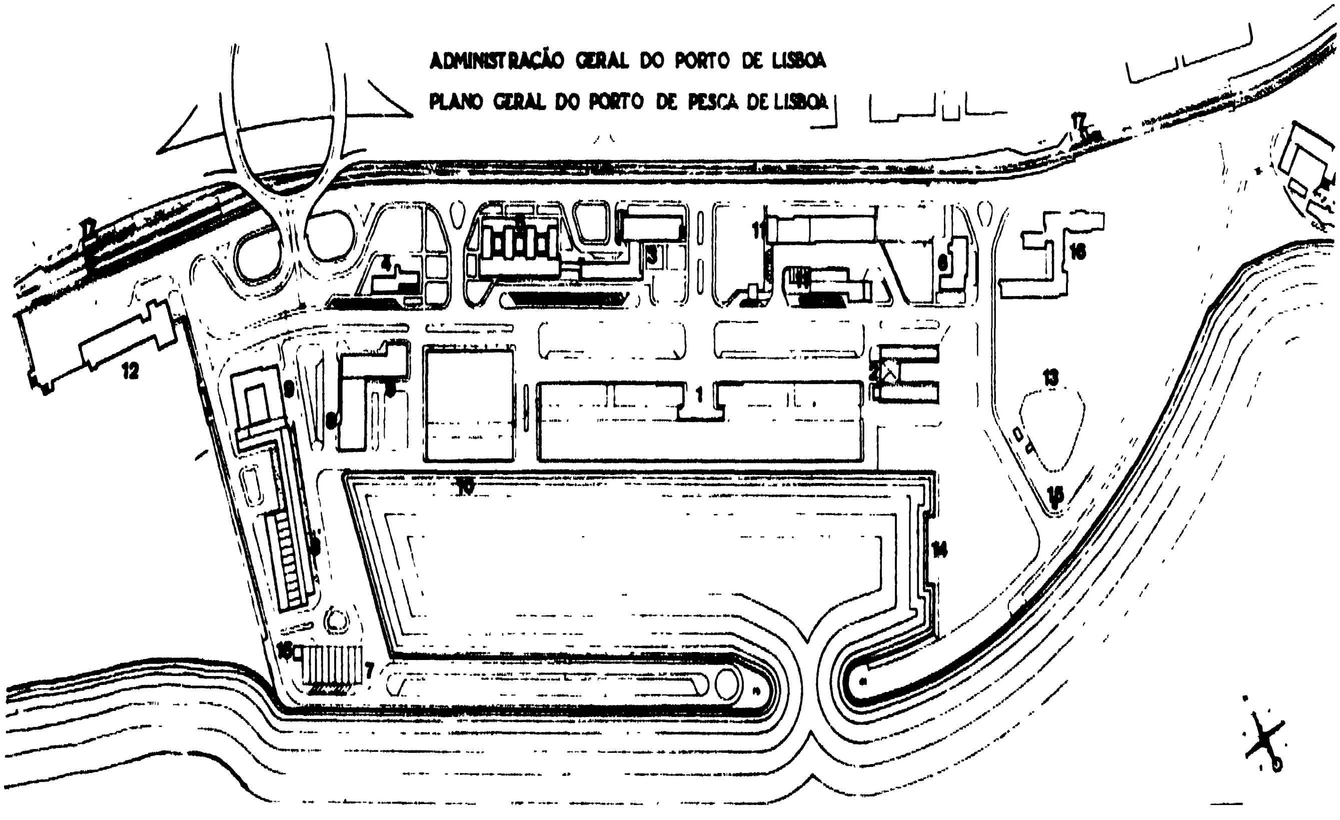
Services généraux. Edifice destiné à l'administration de la compagnie concessionnaire et à l'installation des services d'intérêt général, tels que: postes, douanes, agences bancaires, Mutuelles de la Pêche au Chalut, etc.

Magasins généraux. Ensemble d'installations intéressant essentiellement l'armement de la flotte et comprenant un dépôt douanier et des magasins pour les vivres et pour le matériel destiné à la pêche.

Criée à la sardine et pêche artisanale. Cet édifice permettra d'effectuer les opérations de vente, de préparation, d'emballage et d'exposition du petit poisson à l'abri des intempéries. Il sera situé au voisinage du quai qui lui est affecté. A cet effet a déjà été adapté le môle sud du dock de Pedrouços, où ont été réalisés les travaux maritimes adéquats.

Edifications à la charge de la compagnie concessionnaire

Le décret-loi n°. 40.764 impose à la compagnie concessionnaire l'obligation de construire et d'entretenir les


ADMINISTRAÇÃO GERAL DO PORTO DE LISBOA
PLANO GERAL DO PORTO DE PESCA DE LISBOA
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4
3
11
9
16
12
8
2
1
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15
18
7

Fig 9. Plano geral (em execução)

1. *Edifício da lota*
2. *Comerciantes e higienização de caixas*
3. *Serviços sociais*
4. *Serviços oficiais*
5. *Administração e serviços gerais*
6. *Guarda fiscal*
7. *Abrigo da descarga de peixe miúdo*
8. *Armadores*
9. *Abastecimento gerais*
10. *Central de frio*
11. *Oficinas, garagens e parques*
12. *Institutos de biologia marítima e de technicologia das pescas*
13. *Depósitos de combustíveis*
14. *Desembarcadouro de redes*
15. *Postos da A. G. P. L.*
16. *Escola profissional de pesca*
17. *Estações de caminho de ferro (linha do estoril)*

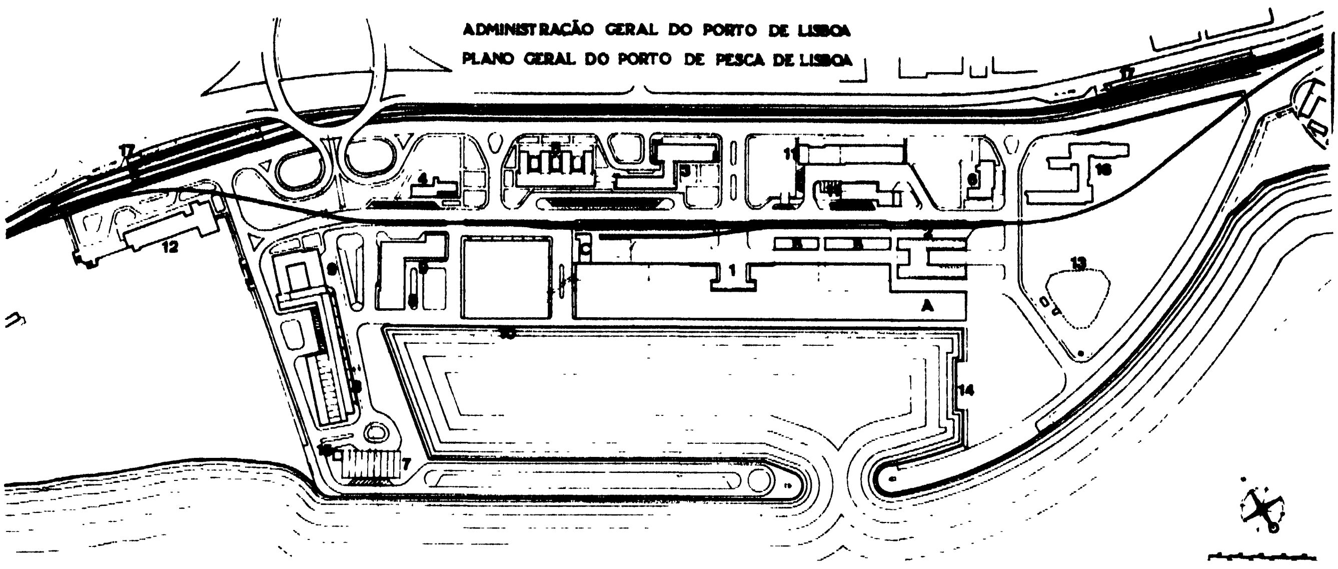
ADMINISTRAÇÃO GERAL DO PORTO DE LISBOA
PLANO GERAL DO PORTO DE PESCA DE LISBOA
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Fig 10. Plan général—prévisions d'agrandissements des installations et de liaison au réseau ferroviaire

1. *Halle de vente du poisson*
2. *Installations pour maréyeurs et hygiénisation des caisses*
3. *Services sociaux*
4. *Autorités maritimes et police de l'AGPL.*
5. *Administration et services généraux*
6. *Garde Douanière*
7. *Criée de la pêche artisanale et sardine*
8. *Installations pour les armateurs*
9. *Magasins généraux*
10. *Central du froid*
11. *Ateliers, station de service-auto et poste d'aprovisionnement*
12. *Instituts de Biologie Maritime et de Tecnologie des pêches*
13. *Dépôts de combustibles*
14. *Quai pour l'armement de la pêche artisanale*
15. *Postes de l'AGPL*
16. *École professionnelle des pêches*
17. *Station de chemin de fer (réseau de l'Estoril).*

A. Extension de la criée *B. Extension des installations de maréyeurs* *C. Station de chemin de fer*

installations portuaires à caractère non permanent ainsi que toutes les installations industrielles.

Notamment, la compagnie concessionnaire a à sa charge la construction des édifices suivants:

(a) Centrale du froid
(b) Ateliers, station de service et poste d'approvisionnement
(c) Dépôt de combustibles

Centrale du froid. La centrale du froid est le complément indispensable aussi pour la fourniture de la glace necessaire à l'approvisionnement des embarcations de pêche que pour la congélation de la matière première fraîche et l'emmagasinage des produits congelés.

Les caractéristiques principales de cette centrale sont les suivantes:

(a) Fabrique de glace: production de 225 tonnes/jour de glace tubulaire, production qui peut être portée à 300 tonnes/jour, dans une première phase, avec des possibilités d'amplification à 600 tonnes/jour dans une deuxième phase
(b) Entrepôts de glace: capacité de 800 tonnes
(c) Tunnels de congélation: 3 tunnels pour 30 tonnes de poisson chacun, soit un total de 90 tonnes par jour; on admet, dans une deuxième phase, l'installation de 3 nouveaux tunnels, d'une production identique
(d) Entrepôts réfrigérés à −2°C (28°F), pour entreposer 200 tonnes de poisson pour une courte durée (3 à 4 jours)
(e) Entrepôts pour poisson congelé à −30°C (−22°F) d'une capacité de 4.500 tonnes, en trois chambres, dotées des conditions permettant l'emmagasinage à long terme.

Ateliers, stations de service et poste d'approvisionnement. Il appartiendra à l'atelier de réparations non seulement de prêter assistance aux véhicules de transport, mais encore au matériel portuaire pour le déchargement du poisson. En vue d'une meilleure utilisation des espaces, les installations pour le dépôt de matériel sont situées à l'intérieur des structures mêmes des ateliers et des remises, mais à un étage supérieur. La station de service complète ce secteur et prête assistance aux véhicules automobiles; à cet effet, elle dispose de deux fosses pour véhicules lourds et d'un élévateur pour véhicules légers.

L'ensemble des ateliers, destiné, dans cette première phase, aux réparations de mécanique et d'éléctricité, disposera d'une dépendance pour les bureaux, d'un cabinet pour le téchnicien qui dirige les services, et d'une salle d'attente.

Dépôts de combustibles. Pour l'approvisionnement de la flotte de pêche, on compte sur une consommation journalière de l'ordre de 300 tonnes de combustibles liquides; à cet effet, seront construits trois dépôts souterrains.

Ces dépôts seront reliés aux quais par un "pipe-line" pour la réception du combustible transporté par voie fluviale en navires citernes. Sa distribution sera faite par les tubes déjà disposés le long du quai, avec prises appropriées.

Edifications à la charge d'autres entités (fig 17)

Dans le plan de l'ensemble est en outre prévue la localisation d'installations pour l'Institut de Biologie Maritime et l'Institut de Technologie des Péches, installations qui formeront un bloc de construction unique.

Un autre édifice prévu dans ce même plan est l'Ecole Professionnelle de Pêche, dont les travaux sont déjà en voie d'achèvement.

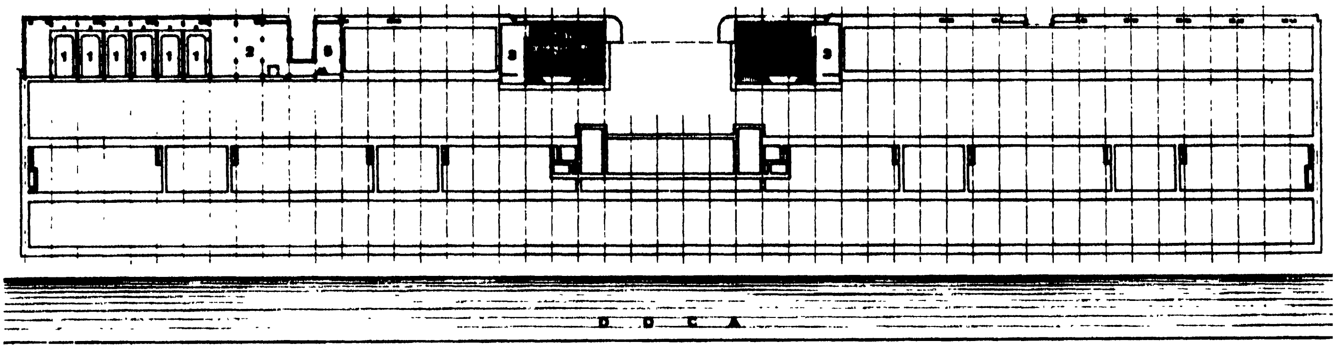


Fig 11. Edifício da lota (cave)

1. *Depósitos de água salgada*
2. *Bombagem e tratamento de água salgada*
3. *Central de aquecimento*
4. *Vestiários. Lavabos e sanitários*
5. *Arrecadação*

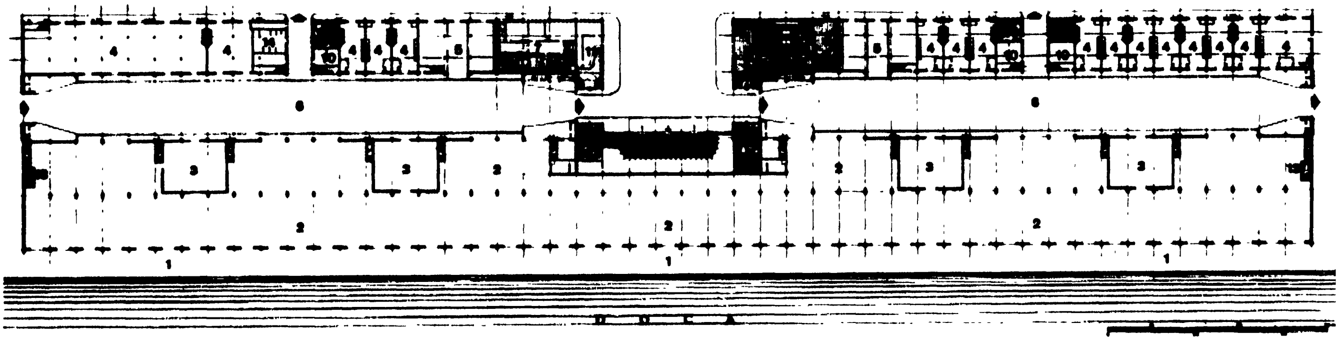


Fig 12. Edifício da lota (r/c.)

1. *Cais de descarga*
2. *Exposição e venda do pescado*
3. *Reserva*
4. *Instalações de comerciantes de pescado*
5. *Distribuição*
6. *Galeria de circulação*
7. *Serviços*
8. *Cantina*
9. *Tesouraria*
10. *Serviços do estado*
11. *Acessos aos escritórios*
13. *Instalações sanitárias*
14. *Posto de transformação*

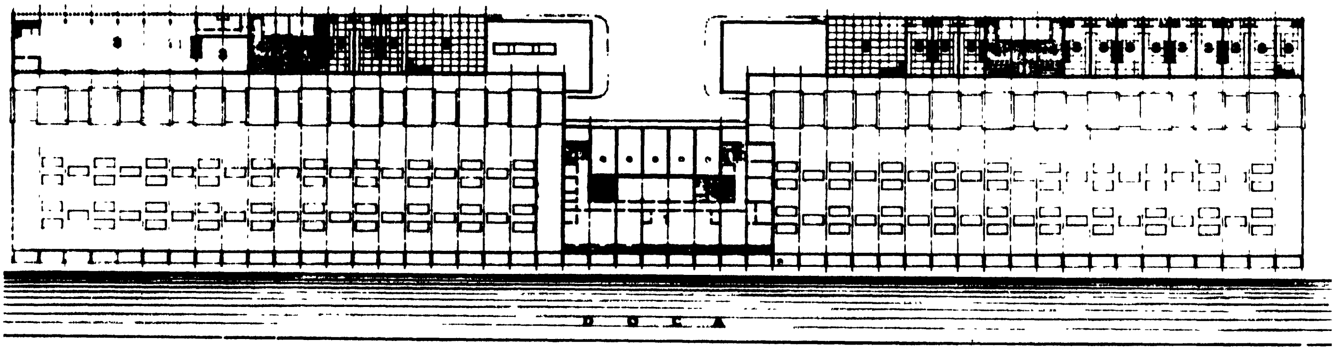


Fig 13. Halle de vente du poisson (1er étage)

1. *Bureaux de l'entreprise concessionaire*
2. *Magasins des caisses en réserve*
3. *Maréyeurs*
4. *Vestiaires et sanitaires*

HALLE DE VENTE DU POISSON

L'emplacement choisi pour le port de pêche offre de bonnes possibilités d'intégration dans les voies d'accès aux marchés distributeurs de la capitale et des zones suborbaines d'autres communes, notamment de Cascais, Oeiras et Sintra.

Deux facteurs fondamentaux ont déterminé la dimention de cet édifice:

(a) La nécessité d'englober l'étendue de quai nécessaire aux embarcations de pêche qui accostent journellement pour décharger le poisson

(b) L'espace nécessaire à la préparation, à l'expédition et à la vente de 400 tonnes de poisson, objectif journalier qui a été fixé.

Les dimensions de cet édifice et sa finalité ont consitué le point de départ pour le développement du plan général,

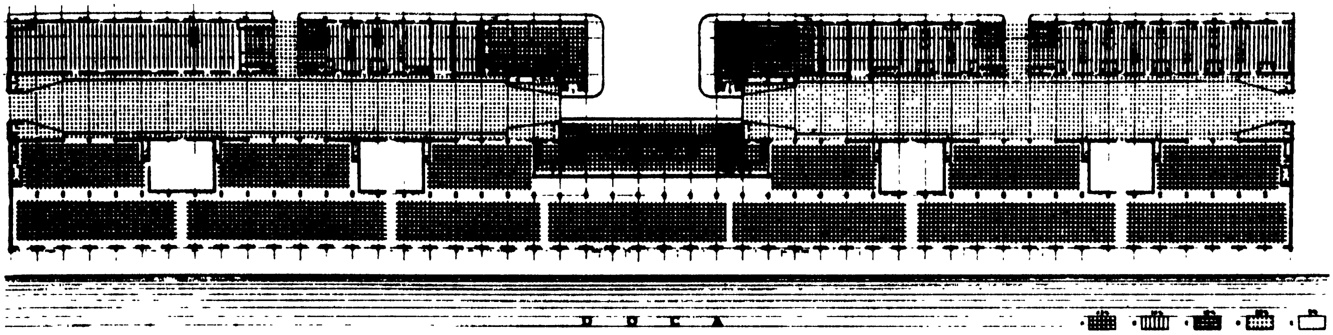


Fig 14. Halle de vente du poisson—Secteurs d'utilization au r/c

A. Exposition et vente du poisson
B. Maréyeurs
C. Services et personnel
D. Circulations principales
E. Réserves

quant à la distribution des autres édifices ainsi qu'à l'attribution des espaces libres et des voies de circulation nécessaires pour assurer un mouvement intense de véhicules et de personnes.

Dans l'ensemble des installations terrestres, c'est l'édifice de la criée qui, pour diverses raisons, se détache plus particulièrement.

Avec ses 294 mètres de long (323 yd) et ses 50 mètres de large (55 yd), il peut être considéré comme le plus vaste édifice construit à Lisbonne dans les derniers temps. La superficie couverte est de 20.600 m^2 (4.9 acres).

La bande comprise entre l'édifice de la criée et l'arête du quai du dock a une largeur de 6 mètres (20 ft), dimension qui a été fixée compte tenu des facteurs déterminants fondamentaux suivants:

(a) D'un côté, admettre la permanence d'un véhicule lourd de transport de marchandises sur le quai, dans les conditions permettant d'effectuer toutes les opérations de chargement ou déchargement, mais permettant également le passage d'un autre véhicule

(b) D'autre part, limiter la distance de l'édifice au navire, afin de raccourcir le parcours du poisson à découvert et de l'exposer le moins possible à l'action du soleil ou de la pluie, étant donné que l'auvent d'abri ne couvre pas toute la zone riveraine.

La largeur de la nef où est déchargé et préparé le poisson en vue de sa livraison au commerce, y compris la galerie de circulation correspondante, ne dépasse pas 40 mètres (44 yds), dimension considérée comme optimale pour ne pas entraîner des concentrations excessives lors de la manipulation du poisson.

La galerie de circulation mesure, transversalement, 15 mètres (16.5 yd) et correspond à 24,5 pourcent de la superficie de la halle. Cependant, cette disposition est indispensable, autant pour assurer la sortie directe du poisson que son entrée dans les installations réservées aux commerçants.

Enceintes pour le triage, l'emballage, l'exposition et la vente du poisson

Sur une largeur de 25 mètres (27.5 yd) ont été établies, parallèlement au quai, les enceintes destinées aux opérations les plus importantes, qui vont du déchargement à la vente aux enchères du poisson.

La première opération à considérer est la réception des paniers où le poisson est hissé des câles des embarcations.

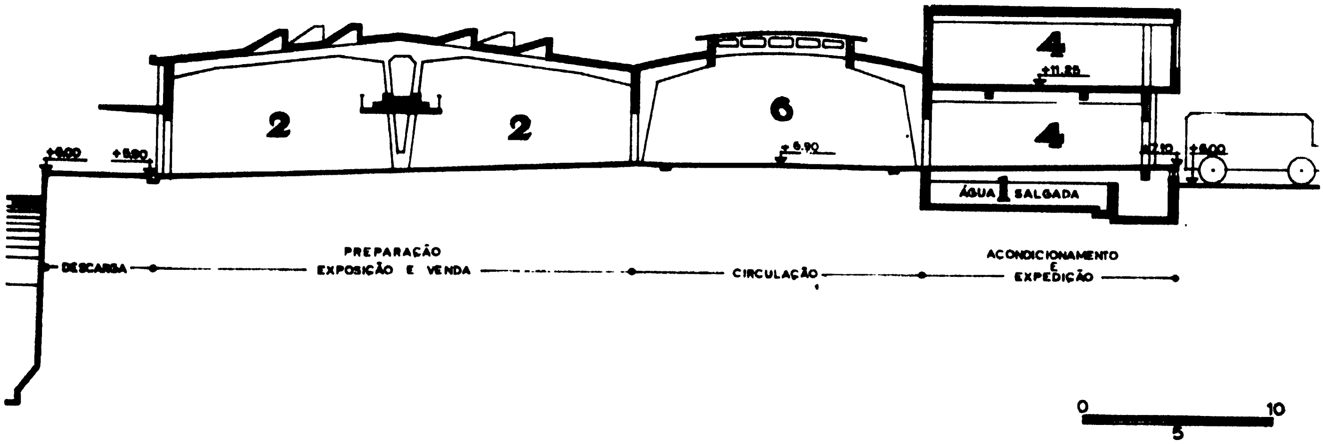


Fig 15. Edifício da lota (corte transversal)
(números referidos à planta do r/c.)

1. Depósitos de água salgada
2. Exposição e venda do pescado
4. Comerciantes
6. Galeria de circulação

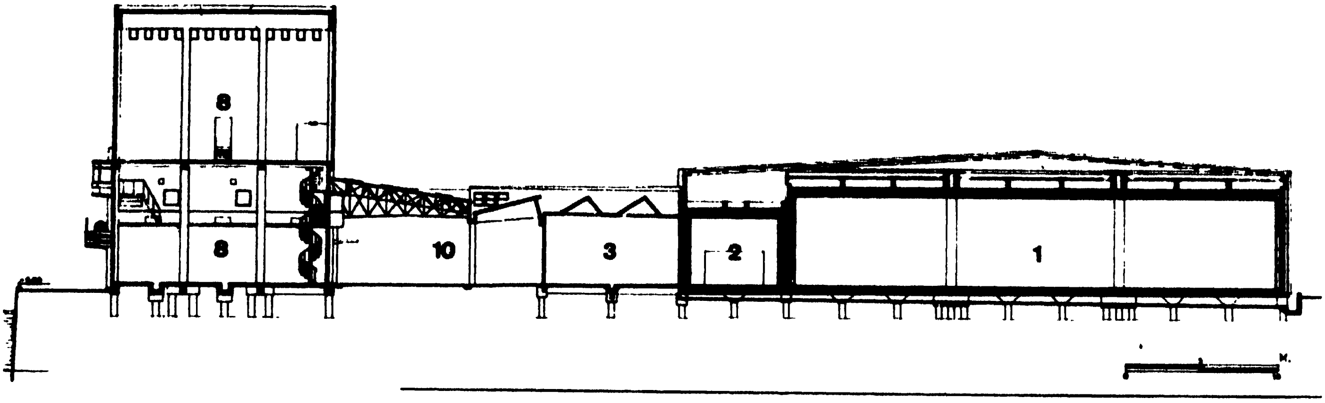


Fig. 16. Centrale de froid (Coupe transversale)

Vient ensuite le lavage avec de l'eau salée; moyennant un système de planches et de bassins, on procède au nettoyage sommaire et au triage du poisson. Dans cette phase de travail est englobée la sélection du poisson, par espèces, qualités et grosseurs; on élimine le poisson dont l'état sanitaire n'est pas satisfaisant.

Non seulement le poisson est trié, mais encore il est lavé avec de l'eau salée dépurée, et emballé dans des caisses appropriées, de 50 kg (110 lb), qui sont déposées de manière à pouvoir être vues par les acheteurs.

La vente à la criée est faite par des crieurs qui se déplacent le long de la nef, après que le public intéressé ait quitté l'enceinte et pris sa place dans les galeries supérieures qui lui sont reservées.

Une fois le poisson vendu, il est transporté directement, dans un camion qui aura accès à l'artère intérieure couverte, ou bien dans de petites charrettes, aux installations privées des commerçants.

Comme nous l'avons dit, la nef principale peut comporter environ 400 tonnes de poisson. Le "plan de zones", annexe au présent rapport (fig 14), permet de juger de la capacité de l'édifice pour ce qui est de la distribution des zones affectées à cette opération, ainsi qu'aux services et aux installations d'appui indispensables.

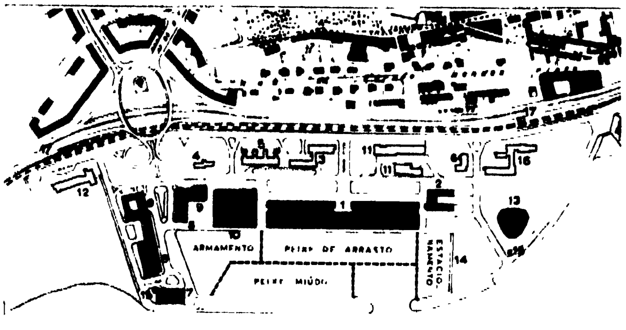
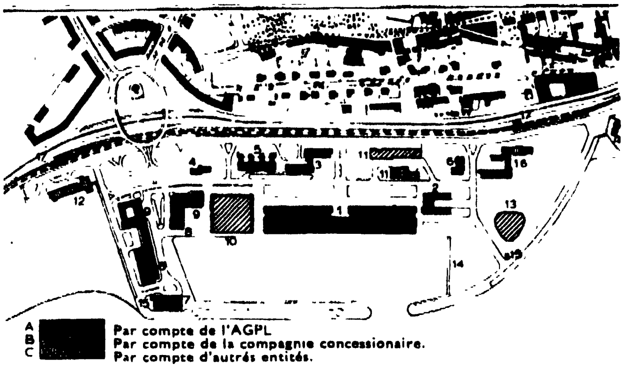


Fig 17. Plan d'utilisation du bassin et des quais

A. Armement
B. Pêche artisanale
C. Pêche au chalut
D. Stationnement de bateaux

Les problèmes sanitaires et d'hygiène dans cette nef sont importants et doivent être résolus d'une manière rapide et pratique. A cet effet, on a installé un réseau général d'eau douce et deux réseaux d'eau salée dépurée: le premier est destiné à l'usage général; quant aux deux autres, l'un, à basse pression est destiné au lavage du poisson, et l'autre, à haute pression, non seulement au lavage de l'enceinte, mais encore des caisses qui ont été utilisées et qu'il n'est pas nécessaire d'envoyer à l'installation spéciale d'hygiénisation.



A Par compte de l'AGPL
B Par compte de la compagnie concessionaire.
C Par compte d'autrés entités.

Fig 18. Indication schématique de la répartition des charges pour la construction des édifices

1. Halle de vente du poisson
2. Installations pour maréyeurs et hygiénisation des caisses
3. Services Sociaux
4. Autorités maritimes et police de l'AGPL
5. Administration et services généraux
6. Garde Douanière
7. Criée de la pêche artisanale et sardine
8. Installations pour les armateurs
9. Magasins généraux
10. Centrale du froid
11. Ateliers, station de service-auto et poste d'aprovisionnement
12. Instituts de Biologie Maritime et de Tecnologie des pêches
13. Dépôts de combustibles
14. Quai pour l'armement de la pêche artisanale
15. Postes de l'AGPL
16. École professionnelle des pêches
17. Station de chemin de fer (réseau de l'Estoril)

A l'intérieur de cette nef, la lumière naturelle est de faible intensité, de manière que l'enceinte conserve toute la fraîcheur possible; pour la même raison, les portes, à glissière, tournées vers le dock, seront normalement fermées, et seules seront ouvertes celles qui sont indispensables pour l'entrée du poisson, et le moins longtemps possible.

L'éclairage électrique a fait également l'objet de soins particuliers, afin de favoriser, par son intensité lumineuse, les conditions de travail, de préparation et de manipulation du poisson ainsi que la visibilité des produits quand ils sont exposés à la vente.

Enceintes réfrigérées pour les conditions exceptionnelles de travail

Dans la nef destinée à l'exposition et à la vente du poisson sont englobés quatre vastes compartiments destinés à la détention du poisson éventuellement sujet à un séjour prolongé. Ces compartiments sont distribués, en relation à l'étendue totale de l'édifice, de manière à pouvoir être utilisés, comme mesure de recours, dans des conditions raisonnables, compte tenu du lieu d'accostage de l'embarcation qui revient de la pêche. On admet que ces installations pourront servir, à bref délai, pour l'entrepôsage de poisson congelé, moyennant des travaux d'adaptation appropriés.

Galerie intérieure de circulation des véhicules

La galerie intérieure de circulation des véhicules a, comme nous l'avons dit, une surface de roulage de 15 mètres de largeur (16.5 yd), correspondant à cinq voies de trafic: deux de stationnement et trois de circulation.

Les deux voies de stationnement sont situées, l'une près des portes de sortie de l'enceinte de vente, et l'autre du côté opposé, le long des portes intérieures des commerçants de poisson.

Les opérations de chargement du poisson peuvent ainsi être effectuées à l'abri de l'action directe des agents atmosphériques, aussi bien pour la commodité du personnel que pour la protection du poisson.

Cette galerie est dotée d'une bonne ventilation pour permettre l'évacuation des gaz d'échappement des véhicules automobiles, et le revêtement du parquet assure un écoulement facile et un lavage rapide.

Distribution du poisson

Le bloc destiné aux commerçants, dans le corps nord de la criée, dispose, de chaque côté de l'entrée principale, d'une enceinte pour la distribution du poisson, c'est-à dire d'un emplacement où est effectuée la distribution aux détaillants. Dans ces enceintes, on procède au triage du poisson, en vue de la composition de lots pour la vente, et c'est pourquoi y règne une grande animation. Pour assurer l'hygiène de cette enceinte, ont été crées les installations accessoires nécessaires pour un lavage rapide et efficace du poisson.

Galerie pour les acheteurs

Afin d'éviter l'amoncellement des acheteurs—grossistes et détaillants—dans les locaux de service, on reconnaît la nécessité d'assurer la plus large indépendence possible à la zone de vente et d'exposition, en la dotant d'une galerie élevée, formant un balcon, dont les bancs permettent de contenir le public nombreux qui accourt aux ventes aux enchères. Les personnes intéressées à l'achat, disposées à des hauteurs différentes, ont ainsi une visibilité raisonnable.

Cette galerie divise, en son milieu, la nef centrale; on y accède au moyen d'escaliers disposés de manière à ne causer aucun embarras aux autres opérations de la criée. Il existe divers accès à la galerie par des escaliers rationnellement distribués, comme l'exige la nécessité d'un écoulement rapide et commode.

Installations pour les commerçants

Le problème des installations des commerçants ne peut être considéré comme résolu par les constructions déjà effectuées dans l'édifice de la criée, même compte tenu de celles dont on prévoit la réalisation à court terme. D'autres installations, plus importantes et dotées de nouvelles conditions d'utilisation, seront crées dans le port de pêche de Pedrouços.

Les commerçants de poisson qui ont leurs installations dans cet édifice sont situés à une courte distance du lieu de déchargement et de vente du poisson et occupent la presque totalité du bloc nord de la criée. Ils disposent ainsi de conditions d'accès que l'on peut considérer comme exceptionnelles.

Chacune des installations destinées aux commerçants se compose de deux enceintes principales: une au rez-de-chaussée, une autre à l'étage supérieur. Au rez-de-chaussée a lieu la réception du poisson acquis à la criée. Il y est traité et emballé en vue de son expédition. A cette effet, chacune de ces enceintes dispose, au rez-de-chaussée, de deux larges ports: l'une tournée vers la criée et l'autre du côté opposé, pour l'expédition du poisson. L'étage supérieur est utilisé comme entrepôt et dépôt d'emballages; il dispose de vestiaires et d'installations sanitaires.

Au rez-de-chaussée, chaque commerçant a à sa disposition des bassins de lavage du poisson et une petite dépendance pour la comptabilité de son mouvement commercial; ici également, se trouveront des emplacements pour les tables de travail, pour les balances et pour un petit dépôt de sel. La communication entre le rez-de-chaussée et l'étage supérieur se fait par un escalier à une seule volée, afin de mieux utiliser l'espace et pour faciliter l'accès des matériaux à entrepôser.

Chaque installation de commerçant dispose d'eau potable pour l'usage général, ainsi que d'eau salée et dépurée pour le traitement du poisson à vente que celui-ci soit expédié ou lancé sur les marchés voisins.

Près de la porte d'expédition vers l'extérieur, chacune de ces installations est pourvue d'un réceptacle, extérieur à l'édifice, pour les détritus de poisson. Ces détritus sont lancés dans une conduite établie de manière qu'ils puissent être rassemblé en vue de la fabrication de farine, à n'importe quelle heure et indépendamment du mouvement du poisson frais destiné à la consommation. Ainsi est maintenue une ambience plus hygiénique et assurée l'utilisation économique des sous-produits.

Entrepôt de caisses de réserve

A l'étage au-dessus des installations de distribution est situé le dépôt des caisses de réserve de la compagnie concessionnaire destinées à l'emballage et au transport du poisson.

Cantines pour le personnel de la criée et le public

Le personnel nombreux qui travaille au service de la compagnie concessionnaire, aux opérations de déchargement, de triage et d'emballage du poisson, peut, durant les heures de service et dans les intervalles de repos, prendre des boissons réconfortantes ou de petits repas, à prix réduits. A cet effet, ces dépendances occupent une position centrale dans l'édifice de la halle de vente.

Les autres travailleurs au service des commerçants, ou bien occupés à un autre service quelconque inhérent à l'exploitation industrielle ou commerciale du poisson et, d'une manière générale, le public qui fréquente la criée, disposent d'une seconde cantine, en régime normal en ce qui concerne les prix.

Installations des services de contrôle et d'administration de la halle de vente du poisson

Dans la partie centrale de l'édifice de la criée sont installés les services de la compagnie concessionnaire, à qui sont ainsi assurées des conditions d'accès rapide aux locaux de travail et la possibilité d'effectuer, sans perte de temps, les opérations d'enregistrement et de trésorerie.

Cette position centrale a imposé la création d'une place, du côté nord de l'édifice, de manière que les entrées et les sorties de ces services puissent etre effectuées en complète indépendance des opérations concernant la manipulation du poisson.

Les services comprennent, des installations pour le contrôle et la police, la trésorerie et les bureaux.

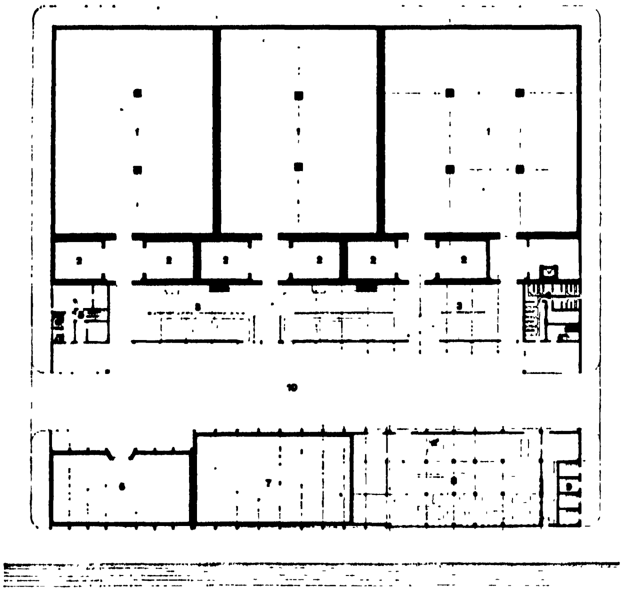


Fig 19. Centrale du froid (r/c.)

1. Magasins de poisson congelé
2. Tunnels de congelation
3. Préparation et congelation par saumure
4. Eléctricité (seccionnement)
5. Services
6. Magasin
7. Magasin de glace
8. Compresseurs
9. Électricité (transf.)
10. Circulation

Le contrôle et la police occupent un pavillon pratiquement isolé, dans le coin nord-ouest de la petite place centrale en question, et englobent les installations suivantes: inspection sanitaire, avec salles pour le public, bureaux, laboratoires et salle d'attente.

On prévoit en outre, à proximité de ces services, une petite dépendance pour la douane et une autre pour la garde douanière.

La trésorerie, dotée d'accès faciles de l'extérieur, est située en face de la petite place centrale, au rez-de-chaussée.

Les bureaux, situés au premier et au deuxième étages du corps central de la criée, englobent un ensemble de dépendances de l'Administration, pour la gérance, les services de statistique, les affaires courantes et la comptabilité.

Poste de commande et signalisation

Au point le plus élevé de l'édifice, dominant l'ensemble du dock de pêche, est situé le poste de commande.

Presque en face de l'entrée du dock, ce poste occupe une position en évidence, qui lui permet de fonctionner comme poste de signalisation. Il dispose d'installations pour le personnel en service et de dépendances pour un petit poste de radio. Sur la terrasse supérieure ont été disposés les mâts de signaux et les antennes.

Installations spéciales

On a créé une installation de captation et de traitement d'eau salée, dont la distribution est effectuée par deux réseaux:

(a) l'un, à haute pression (7 kg/cm^2) (99 lb/in^2), destiné au lavage des parquets, après le déchargement et le triage du poisson, ainsi qu'au nettoyage général de tous les endroits qui peuvent contenir des détritus du poisson

(b) un autre, à basse pression (3 kg/cm^2) (42.6 lb/in^2), utilisé spécialement pour le lavage du poisson dans les installations de la criée et des commerçants.

L'eau salée est emmagasinée dans les caves de l'édifice, où sont construits six dépôts, d'une capacité globale de 600 mètres cubes (786 yd^3).

En ce qui concerne l'éclairage, considérant que la travail de la criée est en grande partie réalisé durant la nuit, on a utilisé et appliqué, avec des soins particuliers, les techniques les plus adéquates à cet effet.

Quant à la force motrice sont prévues des prises d'énergie sur le quai, autant pour l'alimentation des treuils utilisés pour le déchargement du poisson, que pour la fourniture aux navires accostés.

Tous les services disposent d'installations sanitaires au voisinage des locaux de travail. Les installations du public en général et celles du personnel qui s'occupe du poisson se trouvent dans le sous-sol du corps central. Bien que ces installations aient parfois un grand développement les accès ont été conjugués d'une manière différenciée, afin d'éviter une afluence exagérée de personnes à chaque unité.

Dans les vestiaires du personnel ont été montés des bassins pour le lavage des bottes et autre équipement, et il existe des dépendances permettant, le séchage du linge d'un jour à l'autre.

L'établissment du réseau d'égouts et d'évacuation des détritus du poisson susceptibles d'être économiquement utilisés a fait l'objet d'une étude attentive. Parmi les soins spéciaux que l'on a apportés dans ce domaine, il faut mentionner la pente, vers l'intérieur, que l'on a donnée à la bande du quai adjacent à l'édifice de la criée. Ceci permet d'éviter que les détritus du poisson ne soient déversés dans le bassin du dock.

ANALYSE DE L'ATTRIBUTION DES ESPACES

Afin de permettre d'apprécier les conditions d'utilisation de la superficie d'implantation de l'édifice de la criée, a été élaboré un "plan de zones", joint en annexe (Tableau I), où est indiquée, pour le rez-de-chaussée, la délimitation des zones des services corrélatifs.

En premier lieu, étant donné son importance, nous signalerons la superficie destinée à la manipulation du poisson, d'un total de 7.000 m^2 (1.7 acres) (triage, exposition, vente et unités réfrigérées), représentant 50 pour cent environ de la superficie totale.

Vu son importance fonctionnelle, vient ensuite le secteur des commerçants (y compris la distribution) avec 2.500 m^2 (0.7 acre).

Enfin, de ce plan schématique ressort la situation centrale des services, dont la superficie globale occupe, dans l'ensemble, 7 pour cent, chiffre qui s'élève à 10 pour cent si l'on englobe les superficies des autres installations accessoires.

TABLEAU 1. EDIFICE DE LA CRIÉE
REZ-DE-CHAUSÉE
(Superficie totale: 15.000 m^2)

Designation	*Superficie*	%
Triage, exposition et vente	6.070 m^2	40,4
Unités réfrigérées	900 m^2	6,0
Galerie de grande circulation	3.675 m^2	24,5
Commerçants	1.950 m^2	13,0
Distribution	490 m^2	3,2
Cantine	345 m^2	2,3
Services	765 m^2	5.1
Installations sanitaires	320 m^2	2,1
Divers	485 m^2	3,4
Totale	15.000 m^2	100,0

Note: Les enceintes d'exposition et de vente comportent 370 tonnes de poisson et les unités réfrigérées 48 tonnes, ce qui donne une capacité totale de 418 tonnes

Engineering Aspects of Fish Market Design and Operation

by P. A. Cox

Aspects techniques du projet et du fonctionnement d'un marché de poisson

Le présent document traite des questions techniques se rapportant spécifiquement aux marchés de poisson et ne s'occupe pas de la structure de base, qui n'est pas essentiellement différente de celle des autres installations portuaires. Par conséquent ce document traite surtout des problèmes posés par la manipulation et des aspects économiques de la réorganisation et de la mécanisation. Dans un port, un groupe de travail a pris l'initiative de réunir les représentants des groupes ayant des intérêts dans le marché de poisson. L'auteur mentionne les études opérationnelles et économiques minutieuses qu'il faut entreprendre avant de réaliser les plans de réorganisation. On traite ensuite des différentes phases des opérations de débarquement et de manipulation. On discute de la disposition et des emplacements des amarrages et des quais. On compare es deux méthodes qu'on peut adopter pour le déchargement des bateaux, ainsi que la manipulation des caisses à poisson sur le quai ou dans le marché—en utilisant soit des transporteurs, soit des chariots élévateurs à fourche et à palette; l'auteur estime que ce dernier système est le meilleur et le recommande. Il montre ensuite comment le système d'étalage affecte le choix de la méthode de manipulation. Les chariots élévateurs à fourche et à palette sont considérés comme étant la meilleure méthode pour transporter les caisses hors du marché, et on remarque que ces dispositifs trouvent leur utilisation optimale dans les bâtiments dépourvus de plate-forme de déchargement à l'arrière. On décrit les aspects structuraux généraux des bâtiments, notamment en ce qui concerne l'isolation. L'auteur estime qu'après l'adoption de méthodes mécaniques de manipulation on peut utiliser au mieux l'espace des quais et les zones portuaires en élargissant et en raccourcissant les bâtiments du marché. Traitant du choix entre les portes larges et les portes étroites, l'auteur affirme sa préférence pour ces dernières. On fait des recommandations sur l'accès des véhicules au marché, ainsi que sur les problèmes connexes de la contamination et de la pollution de l'air. L'auteur fait ensuite des propositions fondamentales relativement aux planchers, à l'écoulement des eaux usées, à l'éclairage, aux services et au lavage des caisses. Enfin il préconise que les opérations de service des bateaux de pêche soient effectués en dehors de la zone des marchés.

Aspectos técnicos de la concepción y funcionamiento de los mercados pesqueros

Se tratan las cuestiones técnicas propias de los percados pesqueros, salvo los diseños estructurales, que son sencillos y análogos a los de otras partes de los puertos; se consideran, pues, principalmente los problemas que presenta la manipulación y los aspectos económicos de la reorganización y mecanización. Para un determinado puerto, un grupo de trabajo consideró conveniente reunir las numerosas partes interesadas en el mercado pesquero. Se mencionan los minuciosos estudios económicos y funcionales que son necesarios antes de proceder a los planes de reorganización, tratándose a continuación las diversas fases de las operaciones de desembarque y manipulación. Se discute la configuración y alineamiento de los muelles y radas. Se hace una detallada comparación entre dos posibles métodos de descarga de los barcos y la manipulación de los envases, tanto en el muelle como en el mercado, que puede hacerse, por medio de transportadores o de camiones-grúa, recomendándose este último procedimiento, por considerarse mejor. Se menciona después el efecto de la forma de disponer las ventas sobre los métodos de manipulación. La mejor forma de retirar los envases del mercado es por medio de camiones-grúa, señalándose que éstos pueden utilizarse perfectamente en los edificios desprovistos de plataformas traseras de descarga. Se describen los aspectos generales de las estructuras de los edificios, con particular referencia al aislamiento. Después de la introdución de la manipulación mecánica, los muelles y las zonas portuarias podrían aprovecharse mejor si los edificios de los mercados fuesen más anchos y más bajos. Se discute si las puertas deben ser anchas o estrechas, prefiriéndose estas últimas. Se dan recomendaciones para el acceso de los vehículos al mercado y sobre los problemas conexos de la contaminación y polución del aire, haciéndose después propuestas básicas sobre suelos, desagues, iluminación, servicios y lavado de los envases. Se indica, por último, que las operaciones de servicio de los barcos de pesca deben efectuarse lejos de los mercados.

ENGINEERING problems of fish markets are relatively unsophisticated and the successful use of engineering techniques is primarily related to the layout of the market and careful provision and detailing of the equipment and facilities which are provided therein, Until recently fish landing and marketing operations were, like fishing itself, labour intensive, but because fishing markets were usually in areas having surplus labour or relatively high unemployment, little thought was given to the cost of such labour or the possible economics to be achieved by mechanization and reorganization. In many areas labour is no longer easy to obtain, or cheap, and modern engineering or operational study methods must be used to develop and maintain fishing as an economic industry and fish as a vital source of protein. However, as fish is usually handled and sold in relatively small boxes of about only 50 kgs (110 lbs) and the various routings for boxes in a market are complex and are used in a random manner for a relatively short period each day, it must by no means be assumed that reorganization of some or all of the handling operations will necessarily produce economies. Each case must be considered on its own merits and expensive, sophisticated equipment should only be installed if a substantial overall saving can be achieved. If the saving is marginal then a more simple scheme having a lower capital cost and shorter write-off period should be used; it can then be changed more easily if, in due course, circumstances require it.

The handling of fish landed by freeze trawlers or factory type vessels, already processed and packaged, is virtually no different from the handling of general cargo and requires no further comment here except to emphasise the necessity to have the cold store situated such that the fish can be rapidly transferred from the ship to it.

Implementing reorganization schemes

The landing and selling of fish loose or boxed in ice at sea is a much more complex organizational and handling problem involving many interests in the immediate area of the market, vessel owners, vessel crews, stevedores, salesmen, market porters and plant operators, transport operators, fish merchants and curers and last, but not least, the harbour authority. These interests can conflict and where a market is being developed or reorganized it is desirable that all these interests should be consulted by the authority having the primary control of the market so that the scheme formulated can be known and, if possible, accepted in principle by all parties before it is introduced. At one Scottish port the market is under the control of the port authority who set up a Working Party having representatives from many of the above interests and their consulting engineer to prepare a scheme for reorganizing the market. The Working Party advertised its formation locally and in the technical press and requested anyone having ideas or views to submit them in writing. Many submissions were received and those people having useful ideas were interviewed. Visits were also made to other similar fish markets. The Working Party was then able to outline possible development schemes and instruct the harbour engineer and the consulting engineers to draw up plans and estimates for further consideration. Before final decisions were taken on the scheme to be adopted demonstrations were arranged of various types of mechanical equipment which were thought suitable for use in the handling operations.

ECONOMICS OF MARKET DEVELOPMENT

Obviously reorganization or mechanization of a market should only be done if it is economic and, in order to determine the degree to which this should be done, it is essential to cost out many alternative schemes including the one already in use. This involves operational study of the physical operations being performed, drawing board studies of alternative methods, and the use of modern techniques such as Discounted Cash Flow to obtain a comparison of the true costs of the alternatives. It often appears to happen that the fishing market and industry does not have to bear the full cost of basic harbour structures used for the market or that it is subsidized by national or local authorities for other than strictly economic reasons. There can be difficulties in making the financial assessments when, for example, an old quay or market building, the cost of which was written off many years before, is to be replaced by a new structure for which financial provision will have to be made in future years. Nevertheless, it is still desirable to carry out the comparative overall cost studies so that the authority has all the relevant information when the final decisions are taken. The prime objects of the market must be to handle the fish quickly but without damaging it or exposing it any more than is absolutely necessary to drying winds or high temperatures. In the market the fish must generally also be displayed so that buyers can readily inspect it—where sales are by samples this is not necessary.

The various stages of the landing and handling operations will now be dealt with in turn.

Berthing

The vessels normally berth parallel to the quay or, where the quay length is limited, at a small angle to it so that one vessel overlaps the next. Elaborate fendering is not needed but the berthing face must be either continuous or have horizontal and vertical members at sufficiently close centres to prevent the vessel's bow or protruding gear being caught as the vessel rises on the tide—a battered face may assist in this. Simple mooring bollards and ladders are required at close centres. Some fish markets have berths arranged in saw tooth fashion. This is an economic use of the berthing frontage provided all the vessels are of the same length and there is little likelihood of the size changing, but is more expensive to construct and maintain than a straight quay. Further economies of frontage can be achieved with finger piers but these present increased handling problems and are of doubtful worth.

Unloading

Traditionally fish is removed from the vessel's hold in baskets or single boxes slung from a rope on a free swinging derrick pole or spar rigged off the vessel's mast, the rope being handled on a powered capstan either on the vessel or ashore. Sometimes the boxes are slid ashore on special boards. With such a rig three men can land 120 to 150 baskets an hour. This is a high rate of working. Replacements of this simple derrick by a shore mounted powered slewing and luffing jib or travelling hoist on a horizontal arm could save one man but is unlikely to produce a higher unloading rate or show overall economies unless the contiguous operations are also reorganized. To achieve higher unloading rates it is necessary either to make each lift heavier, say, three or four boxes or baskets, or arrange to place the single basket or box load on to a horizontal conveyor immediately above the hold or hatch and thus eliminate the time for swinging the load ashore and returning the hook. Considering the first of these alternatives it would obviously be impracticable to lift three or four baskets. Lifting this number of boxes is straightforward but it would mean that the fish would have to be put into them in the confined space of the fish hold and the boxes would have to be stacked there; separation of the storage ice would be a problem, as would the smallness of hatches on most fishing vessels. As boxing at sea develops this method will show advantages, but to achieve the full benefit of the heavier lift it will be necessary to make the vessel's hatch very much larger to reduce moving of the boxes within the hold.

Box movement in market

Once on the quay the stack of boxes would have to be taken into the market by a fork lift or pallet truck as they would be too heavy to be dragged or taken on a hand cart. In the second alternative, which has developed from the use of slide boards for the baskets, the single baskets or boxes are transferred immediately above the hold on to an open conveyor or the fish are tipped from the basket on to a belt conveyor. In either case the conveyor and transfer platform cantilevers over the ship from a supporting structure ashore and takes the container or loose fish right across the quay into the market and thus eliminates part of the shore handling operation. Nevertheless boxes still have to be taken from the conveyor discharge point to be laid out or stacked. Of the two, the multiple box system has the greater flexibility and lower capital cost but it significantly alters the method of handling the fish in the vessel hold. The conveyor system is less flexible —this might not matter where the vessels are large or of uniform size—and is more expensive to maintain as well as in capital cost. Where fish are tipped loose on to a conveyor, quality may also suffer. It has an advantage in ports where extremes of weather are experienced in that large doors do not have to be left open to allow the fish to be brought from the quay to the market shed, as the conveyor can be passed through a small opening. On balance the multiple box system would appear to be the better line of development than the alternative method.

Even if the traditional method of bringing the fish ashore is retained, handling on the quay and in the market can be mechanized. (It is assumed that in any case the basket, if used, goes no further than the quay and that the fish is there transferred into a box). The single box instead of being manhandled from the quay into the market building can either be stacked and the stack handled by a fork lift or pallet truck, or it can be moved by a conveyor. The advantages and disadvantages of the two methods are similar to those already outlined in the previous paragraph although, because the conveyors do not have to be cantilevered out over the ship and can be supported from the floor as required, they are relatively cheaper and the method does not have such a heavy cost disadvantage.

Sales display

The handling methods are critically affected by the requirements of the salesmen and buyers for the display of the fish at the point of sale. For example, if the boxes have to be laid out in a single layer for individual inspection then there is little point in having a stack system for bringing them from the quay. Stacked boxes require less floor space and it is likely that the economies of providing floor space and the mechanical handling equipment and the cost of market building will in due time cause the industry to adjust its sales methods to allow boxes to be stacked four or even six high.

Despatch of boxes

After sale the boxes have to be loaded on to vehicles. Here the problem is more simple than landing the fish and there is little doubt that when mechanization is introduced handling by fork lift or pallet truck is the right answer. Even where boxes have been displayed for sale in a single layer a fork lift truck can readily be used to stack them as it collects them for conveyance to the vehicle.

All these proposals regarding the use of mechanical equipment presuppose that the traditional wooden boxes are replaced by aluminium or plastic boxes designed to stack without damaging the fish in the lower box and having runners underneath to allow fork lift trucks to lift them.

Older markets often have floors sloping up to loading platforms at the face away from the quay to facilitate the hand loading of boxes on to vehicles. Mechanical trucks can load off these although not efficiently. New markets should therefore be constructed with a flush floor, as are new transit sheds in most ports, to allow easy manoeuvring and mechanical loading of vehicles. In countries where a large proportion of cargo is still moved by rail there may be reservations about this proposal, but as most fish goes first to processing premises in or near the port area before being despatched inland, there should be few markets where consideration has to be given to the direct loading of rail wagons.

MARKET BUILDINGS

Space requirements

Quays in front of fish markets are generally narrow, being between 3 m and 6 m (10 ft by 20 ft) wide. Market buildings are usually also relatively narrow, some being as small as 11 m (36 ft) wide and few exceed 35 m (115.5 ft). Straightforward single span double pitched roofs are normal. The roof is usually of corrugated asbestos sheeting with frequent transparent sheets to provide natural daylight. Control of temperature within the building is important and consideration should be given to improving the insulation value of the roof by double skin or similar construction. Sealed double skin transparent sheets are now available for this purpose.

Fish markets generally occupy an unduly high proportion of valuable and expensive waterfront length in relation to the amount of "cargo" handled over the quay. This is the result of the "cargo" being unloaded in small units from many small vessels and then being taken by hand to the sale area. With the introduction of higher rates of unloading by mechanical equipment and the faster handling of the stacks of boxes by mechanical trucks there would appear to be a good case for developing and reorganizing fish markets with less quay frontage and wider market buildings without loading platforms. Such a form of development has advantages where the market is used for the sale of boxed fish brought in from other ports, as will be described in a later paragraph. In congested port areas consideration should also be given to providing car parks or office space over fish markets. Unlike general cargo transit sheds clear headroom in excess of about 4 m (13.4 ft) is of no use in fish markets and so access for first floor development would be no problem. One disadvantage of such a form of construction would be the internal columns to carry the multiple span construction which would then be necessary.

Doors

Market buildings are often completely open along their quay face or else have doors which occupy as much as 80 per cent of the wall space. Such arrangements facilitate access to single boxes being moved by hand but where mechanical trucks are used there would appear to be no good reason for perpetuating this arrangement—provided the quay is wide enough to allow the manoeuvring of the trucks. Certainly where the conveyor system is used for bringing the boxes or fish into the market much smaller openings would be adequate. Again because of the limited headroom required in the doorway and in the market, roller or up-and-over doors can readily be installed and are to be preferred to other types as they provide minimum obstruction to, and are safe from damage by, the handling operations. Narrow door openings give better protection to the people in the shed during adverse weather and can assist in protecting the fish from drying winds and high ambient temperatures. If the sides of the market are to be closed solid walls are cheaper than doors.

Vehicle access

Depending on the marketing arrangements there may be less justification for limiting door openings on the despatch side of older market buildings having loading platforms. Where these platforms do not exist the best arrangement appears to be to have a vehicle access route within the building and doors at each end. In narrow buildings this route would be along the wall away from the quay face but in wider buildings, particularly those handling fish brought from elsewhere, it could well be away from this wall thus enabling the brought-in fish to be stacked separately on one side of the route without interfering with fish coming in from the quay.

Contamination and air pollution

The introduction of mechanical vehicles into the market building brings the problems of oil and dirt on the floor contaminating fish and petrol and diesel fumes polluting the air. The first can be kept in check by confining vehicles, other than the pallet or fork lift trucks, to a particular route and ensuring that drainage falls are such that the vehicles' route does not drain on to the fish handling area. It must be assumed that the trucks will be carefully maintained and operated by the market authority to prevent their contaminating the fish. To reduce air pollution the trucks must be battery operated. If fish merchants' premises are close to the market consideration could be given to limiting access for vehicles removing the fish to battery operated trucks, or battery operated tractors having trailers. If such control over deliveries from the market is not possible and petrol or diesel engined vehicles have to be admitted strict control over their operations must be ensured and in a large closed building forced ventilation may have to be provided. Extraction of air from floor level alongside the route is likely to produce more satisfactory results than the blowing in of fresh air. Depending on the type of floor construction the installation of underfloor ducts may be expensive and in some circumstances there could be advantages in taking them overhead notwithstanding the obstructions they may cause.

Floors

Quays and market floors must have a smooth dense surface which can readily be washed down and will not encourage the growth of bacteria. Concrete is almost universally used for this purpose and, provided a high grade is used and joints are properly detailed, it is doubtful if, in view of the large areas concerned, there is justification for the use of the high duty floorings now available.

Drainage

Adequate drainage falls are required and, as many harbour authorities will not now allow water from the market floor to be drained straight into the harbour, the simple expedient of giving the floor a straight fall to the quay cannot always be adopted. When arranging falls to internal gulleys care must be taken to avoid sudden changes of slope on main fork lift or pallet truck routes.

Drainage from the quay and market floors will be highly charged with material which will be offensive when decaying and if it cannot be discharged into the harbour or a main sewage system, traps or septic tanks which can be cleaned regularly should be installed.

Lighting

The visual appearance of fish offered for sale is important and good uniform lighting must be provided. Where sales occur always during daylight hours this is no problem but if they occur wholly or partially during hours of darkness, great care must be taken to use a lighting system having a colour distribution as close as possible to that of daylight. Whilst fish is being brought into the market or removed lighting of a less exacting standard may suffice.

Services

Services which must be provided in the market include fresh water hydrants for washing down, telephones and power points for winches, conveyors, etc.—the latter must be of a pattern safe for use in exposed wet conditions. All these can be conveniently mounted near walls or columns where they will not be obstructions and the pipes or cables feeding them can be run either overhead or under the floor as convenient.

Box washing

Automatic box washing machines are necessary in larger markets. Proprietary mobile units fed with water, electricity and possibly propane gas bottles for heating the water appear to have advantages over larger fixed units. They can be moved to the area where they are required to suit the day to day pattern of trade and are less of a financial problem if box sizes or methods of working are changed.

SERVICING VESSELS

It is not intended in this paper to make detailed reference to the provision of facilities for the supply of ice, stores and fuel to trawlers as it is considered that these should be away from the market proper. Bunkering should certainly be done away from the market to reduce the risk of contamination. The supply of stores is a relatively simple problem for small fishing vessels and if for special reasons in a particular port such supplies have to be loaded over the market quay little more needs to be done than ensure that the quay is readily accessible to road vehicles and that it is wide enough to allow one vehicle to pass a stationary one. The loading of ice requires the use of chutes, conveyors, etc. and economically it would appear to be right to concentrate these facilities in one area near the ice plant rather than spread them along the length of the market.

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DISCUSSION

CONSTRUCTION AND LAYOUT OF MARKET HALLS

Cardosa (Portugal) introducing the subject said that the construction and arrangement of market halls involved many factors. Comments should illustrate the interconnection between the design of halls to be built, or already built, and factors such as the quantity of fish unloaded per time available, the size of unloading vessels, diversity of species, sizes and qualities of fish, state of processing on board, unloading methods, handling and sorting systems, sales methods, by auction or not, with or without display, control of shipping, fish flow, traffic flow, processing facilities ashore, maintenance, including cleaning, storage of gear, operation of supplies, and finally administrative methods employed.

Layout of Brixham

Gifford (UK) referred to Gifford's paper (Session V) which dealt with the smaller type of facility designed for boats in the 15 to 25 m range of size. The policy decided upon at Brixham was to produce the most compact jetty and market hall catering for some expansion over the next few years. It was assumed that this jetty would be used only for discharge and loading and that craft would not be expected or allowed to moor alongside it, as swinging and mooring space was available in Brixham harbour. The dimensions were based on the assumption that the offloading was done with a whip to the boat's masthead, operated by a mobile winch on the quayside. The quayside width of 3 m, which was quite small, was considered just sufficient for this purpose at Brixham. There was no intention of using this quay for longitudinal movement of fish or stores.

The market itself was only 12 m wide for double-sided handling with a narrow gangway down the middle for conveying the fish on hand trolleys. The width of canopy over the quayside was important permitting the whip to be used without fouling it, at the same time giving shelter to the unloading gang.

The hall itself was designed so that there was no direct sunlight in the fish area. All light was from the side and it had a high degree of insulation. The ice hoppers were placed at the end of the jetty, so that they could discharge simultaneously into three vessels and into the market itself. Oil fuel could also be taken on board from a drydock at the end of the jetty. It was an open-pile jetty, which was often uncomfortable for a ship to lie alongside. However, floating fenders consisting of a square section timber covered with motor-car tyres filled and stiffened with expanding foam were provided. These would float in the water alongside and were restrained on chains.

Effect of boxing at sea

Cox (UK) dealing with mechanization of box handling within the market said the present method of landing fish in baskets or boxes of about 50 kg at Aberdeen enabled a rate of handling of 120/150 per hour to be achieved using the "whip" method. Since this was a fast rate, it was considered that the provision of cranes or gantries would not speed it up, though it might permit saving one man in the gang. Improvement could only come about when boxing was done at sea and boxes were landed in stacks of three to six in number and handled by pallet or forklift trucks. This would, however, introduce another factor, that merchants would then be only able to see the fish in the top box, and sale by sample might be a more suitable alternative.

Seo (Japan) called attention to Yano and Noda's paper. The relationship between boat length and the unloading operation was one of the things that had been learned from experience at many fishing markets. Troubles had been encountered, usually caused by neglecting the simple factor of width of the fish handling hall. For the sake of efficiency and for the prevention of quality deterioration, the width of the handling hall must be sufficient to allow the rightangular movement of fish from the quay. It was therefore necessary to allow sufficient width so that the load of the one fishing boat could be disposed of within a fish handling area of a length less than that of the boat. Otherwise the movement of fish and trucks would cause obstructions.

Ship size important

Meiners (Federal Republic of Germany) spoke on the design of market halls from the management point of view. His experience favoured halls designed in relation to the size of the ships to be unloaded. This meant that with the increase in size of the vessels to be unloaded, the width from the verge of the quay to the wall of the auction hall would have to be increased. They had a problem of how to cope with a 4.5 m width, which was sufficient for small ships, to be used for landing from ships of 4,000 to 5,000 g.r.t. vessels.

The width of halls, just as that of quays, should also be in proportion to the loads on ships. This meant that you could not use a small and narrow hall, if you had to unload a large ship, because there was an optimal relationship between the ship, the width of the quay and the width of the hall.

Dopplinger (Canada) reminded the Conference that one of the great bottlenecks in the fish handling chain was the actual method of unloading. There were many different methods in use, such as baskets, boxes, net slings, etc. Labour-saving devices such as bucket conveyors, in conjunction with horizontal or moderately inclined belt or slat conveyors, had been tried with varying success. This method, however, still required the presence of men in the hold to feed the conveyors by forking or otherwise manipulating the fish, which could be difficult if the fish were frozen together or were too large for one man to handle. One of the latest systems to come into the picture was the fish pump in all its various designs. Pumps had proved themselves to be efficient and fast but caused damage to the fish. While this was quite acceptable for meal production, it certainly was a drawback where fish for human consumption was concerned. Pumps were more suitable for smaller species such as herring.

Lisbon design

de Carvalho Cunha (Portugal) said that in the work done in Lisbon, a programme had been strictly followed. The studies were greatly influenced by technical data obtained during visits to the main Atlantic fishing ports of Western Europe including Spain, France, Britain, Belgium, Netherlands and Germany. Their new fishing port had very special requirements. One particular characteristic was that it was to be situated close to a large urban zone. The sales halls resembled town market halls where the fish wholesalers and retailers came daily and where all operations had to be done rapidly. In spite of the difficulties involved, the sound principles of common sense had always been borne in mind.

Hopper (UK) said that the unloading rates of between 120 and 150 baskets per hour reported by Cox would mean a net discharge rate per gang of about 5 tons of fish per hour. By boxing the fish at sea, at Aberdeen they had increased the unloading rate to 13 tons per gang/hour. There was also a voluntary reduction of four men in the gang, who transferred to the conventional discharge of fish. A bonus was the gain in quality of the product handled in this manner.

The auction system

Another point made by Cox was that if fish were boxed the unit of discharge could be increased to possibly a pallet-load of six or more boxes. There were so many subdivisions of the catch in terms of size, age, and species that to collect six or more boxes of the same type in the fish room would be very difficult. The pallet-load would have to be landed and then broken down into smaller units for redistribution over the market. It would therefore be worthwhile examining the role of the auction in the light of redeveloping market and auction halls. An auction system also required the boxes to be laid out for display which required costly quayside space. The auction, however, might not be so important as it was a few years ago, in view of the quantity of frozen fish now available. It had been found, in places like Hull, that prices at auction would climb so far but would stop at a point where good quality frozen fish at a cheaper or at least a similar price was obtainable. The auction might thus be losing its value in some of the bigger ports where vast quantities of frozen fish were available.

Stammers (UK) spoke of port buildings, remarking that he was especially interested in design for obsolescence. Because of the advance of fishing technology and improvements in fishing methods, he would be interested to learn whether such structures as auction markets and ancillary buildings should be designed for a limited life and, if so, what that life should be.

Market hall needs

Guckian (FAO) referred, in general, to mistakes that had been made in a number of developing countries in the provision of their marketing halls. First of all, a market hall should be basically a place where fish was sold either in bulk or by sample. This required a high order of lighting, whether artificial or natural sunlight. Many auctions took place between midnight and early morning so that artificial lighting was generally required. Several varieties of artificial lighting were in use from candles and gas, to the many forms of electric lighting including tungsten, sodium, rectified mercury vapour or various combinations of these. Anyone who looked at a codfish or a red snapper in a sodium vapour light would probably never eat fish again! The same was true, to a lesser degree, of a mercury vapour source. Perhaps one of the fluorescent daylight types or a new rectified form of sodium might be the best.

The quay must be relatively wide between the market hall and the quayside. There should be room in most ports for at least two lines of traffic to cater for forklift truck and vehicular traffic to and from the boats, as well as to serve the normal day-to-day maintenance needs of the quay structure. Provision for traffic flow through the hall itself, both transversely and longitudinally was also most important. The structure should be free of columns as far as possible and must be sufficiently high to take bulky loads; a minimum of 5 m clear height above floor level might be a useful standard.

It was also most important that clear access from the rear of the market hall to the roadway system be provided. Adjacent to this there should be adequate parking facilities for vehicles so that they did not clutter the entrances and exits of the market hall, which invariably occurred in many of the older ports.

Lomeli Delgado (Mexico) stated that in Mexico the only experience in the construction of market buildings was at Port of Alvarado. Alvarado was in an earthquake zone where there were frequent tremors and this called for vibroflotation methods because the angle of internal friction of the material determined that this was the most economic method as compared with piles or other systems.

Modern touch at Esbjerg

Bosse (Denmark) commented on the new auction hall in Esbjerg. In the framework of a thorough rationalization which was carried out there in the last few years, the auction hall (built in the early thirties) had been replaced. Originally 3,200 m^2 of floor space was available. The new hall provided 8,160 m^2 and with the control buildings gave more than 9,000 m^2. Only cleaned and frozen fish were dealt with in the hall. In 1965 about 30,000 tons of fish (valued at 35 million Danish marks) were auctioned and in 1968 approximately 25,000 tons at a value of 17 million marks were expected. The basic reason for the reducing quantity was sales difficulties abroad.

The hall was subdivided into two areas: the smaller one for traffic and the larger one for sorting and storage. A ventilation system had been developed for removing exhaust gases to prevent fish meant for filleting being spoiled.

Fish and ice were transported to where the fish was sorted and graded. The graded fish was then put into special plastic boxes of 35 kg content. Internal transport was done by electric trucks. The quay had a zigzag form giving facilities for 18 ships so that about 36 cutters could be unloaded in one morning. In order to guarantee smooth transport flow, columns and internal walls were not permitted in the hall, and this aided frequent flushing and cleaning.

Practice in French ports

Lafouge (France) referred to the handling of fish in the principal French ports. Designs varied in each port where the layout of the hall depended on the size of vessels berthing, the volume of catch landed and stored before sale and the extent of the sorting operations. In Boulogne, a port with large units and catches, the fish was landed by crane. The experience of the port authorities and the users had led to the design of halls with little space between the landing quay and the hall itself. The halls were completely open to the quay and there were no supports nearer than 15 or 18 m to the quay. This arrangement also facilitated unloading operations and the necessary longitudinal movement between the unloading and sorting area and the area where fish was displayed before auction. The hall was about 30 to 33 m long. New halls of 300 m being built by the Boulogne Chamber of Commerce would be of laminated wood on a framework of reinforced concrete and these would require less maintenance than steel.

Campleman (FAO) remarked that the essential function of the market hall was selling. He would defend the auction but he could also appreciate that there was a lot of truth in Hopper's remarks about its disadvantages. Insofar as most auctions were carried out on the basis of display and of individual bidding, a number of difficulties presented themselves with regard to display. The market at Pedrouços, Lisbon, was of special interest, where, by means of an overhead gangway and fish merchants' offices with glass-fronted openings, the inspection by the merchant was greatly facilitated. There might be other methods which could facilitate not just the display and handling of fish but also inspection and auction.

The needs of buyers

Winninger (Federal Republic of Germany) thought that something which had not got due attention was the structure of the buyers' group, whether there were many small buyers or a few big wholesalers. In his port they were confronted with the problem of a big concentration of buyers but also there was a vertical integration, that is to say, enterprises which really had been integrated in all operations, from the catching through unloading, down to the retailer. Whether there were some smaller buyers or a few bigger ones exerted some influence on the display methods used. If there were only a few big buyers larger containers could be used and unloading could then be more mechanized. If there were a large number of buyers then use would have to be made of the smaller box or container and the auction hall would have to provide sufficient room and interim spaces and areas where traders could pass through in order to inspect each different box as the fish would have to be sold in small lots.

SESSION VII

Some Aspects of the Port Structure and Marketing System for Fishery Products in the United States

by G. H. Lyon, C. Hoffman and G. A. Albano

Certains aspects du réseau portuaire et du systeme de commercialisation des produits a la pêche aux Etats-Unis d'Amerique

Bien que l'ampleur de l'industrie halieutique des Etats-Unis rende la généralisation difficile, les auteurs décrivent de façon très circonstanciée la situation actuelle du pays en matière de ports de pêche et de commercialisation des produits de la mer, fournissant des exemples qui en donnent une vue d'ensemble. Ils exposent d'abord l'importance présente de l'industrie des pêches étatsunienne en s'attachant aux quantités mises à terre at à la main-d'oeuvre employée. En 1967, les pêcheurs étatsuniens ont débarqué au total 1.840.000 tonnes (poids vif), pour une valeur de $E.-U. 438,3 millions. En 1966, l'industrie employait 135.636 pêcheurs et 88.748 travailleurs à terre, le nombre de navires atteignant 82.122. Comme le relèvent de nombreuses autres communications, on s'oriente nettement vers la construction de navires de plus grande taille.

Les auteurs ne fournissent pas une liste exhaustive de tous les centres de pêche, car il existe de nombreux petits ports et points de débarquement, dont beaucoup appartiennent à des entreprises privées. Le plus grand port de pêche est San Pedro (Californie), qui reçoit principalement des thons, ainsi que des anchois et des maquereaux, et alimente un important complexe de conserveries. Parmi les autres ports cités figurent Boston (Massachussetts) et les centres de débarquement de poisson destiné aux industries des sous-produits. Le réseau portuaire est satisfaisant, et un haut degré d'efficacité est assuré par le Corps of Engineers de l'Armée étatsunienne. Du fait de l'accroissement des importations de poissons et de produits dérivés, l'industrie halieutique tend à se concentrer dans un plus petit nombre de ports. La communication fournit certaines précisions sur les problèmes de transport et sur l'emballage des produits de la pêche en vue de leur transport.

Les auteurs abordent ensuite le rôle de l'Etat dans le développement des ports, et mentionnent les nombreux organismes qui s'intéressent au développement et à la gestion des ports de pêche. En matière d'installations portuaires, la principale aide financière des pouvoirs publics émane des villes et des Etats, mais on dispose également de fonds fédéraux. Les arrangements d'ordre administratif sont très variés, et les auteurs fournissent des exemples de redevances pour l'utilisation des ports et de leurs installations.

La communication traite ensuite des différents circuits de commercialisation des produits de la pêche aux Etats-Unis, en étudiant brièvement le marché intérieur de gros de la Ville de New York. L'exposé sur les méthodes de vente appliquées dans les principaux ports est illustré par des exemples des pratiques en vigueur à Boston (Massachusetts), Gloucester (Massachusetts), New Bedford (Massachusetts), Seattle (Washington), ainsi que dans la pêche du menhaden.

Les auteurs fournissent ensuite des indications sur le contrôle de la qualité, les services communs des marchés, et le Market News Service du Bureau of Commercial Fisheries des Etats-Unis.

En conclusion, ils présentent les grandes lignes du programme permanent de développement et d'entretien des ports. Si les dépenses sont difficiles à chiffrer avec précision, le budget du Corps of Engineers de l'Armée étatsunienne atteignait en 1965 $E.-U. 589 millions pour les "Coastal harbors and channels".

Aspectos de la estructura de los puertos y sistemas de mercadeo de productos pesqueros en los Estados Unidos

Aunque por razón de su magnitud es difícil generalizar sobre la industria pesquera de los Estados Unidos, los autores explican la situación actual de los puertos pesqueros y mercadeo de pescado en el país con muchos pormenores y con ejemplos que permiten formarse una clara idea. La ponencia comienza explicando la magnitud actual de la industria pesquera de los Estados Unidos dando datos de los desembarques y de la mano de obra. En 1967 los pescadores del país desembarcaron 4.061.000 libras (1,82 millones de toneladas) de peso en vivo valoradas en 438,3 millones de dólares (182 millones de libras esterlinas). En 1966 trabajaban en la industria 135.636 pescadores y 88.748 empleados de tierra. En ese año el número de embarcaciones era de 82.122. Como se ha indicado en otras muchas ponencias, existe una clara tendencia hacia la construcción de embarcaciones de gran tamaño.

No se ha preparado una lista completa de todos los lugares donde de desembarca pescado porque existe una infinidad de puertos y puntos de desembarque pequeños, muchos de ellos propiedad de empresas privadas. El puerto más importante es el de San Pedro de California, conocido principalmente por los desembarques de atún, así como de anchoa y caballa. Es la base de un enorme complejo de fábricas de conservas de pescado. Otros puertos mencionados en el documento son Boston, Massachussets, y aquéllos en los que se desembarca pescado para fines industriales. El sistema de puerto de los Estados Unidos es suficiente y lo mantiene en excelentes condiciones el Cuerpo de Ingenieros del Ejército. Con el aumento de las importaciones de pescado y productos pesqueros, existe la tendencia en la industria pesquera a concentrarse en unos pocos puertos. En la ponencia se dan algunos pormenores de los problemas que plantea el transporte de pescado y el embalaje para ello.

La ponencia pasa a examinar la función del Gobierno en la construcción de puertos y las muchas organizaciones interesadas en el desarrollo y administración de los pesqueros. La principal ayuda financiera gubernamental para las instalaciones procede de fondos de ciudades y Estados, aunque también se dispone de fondos federales. Existen muchas organizaciones administrativas distintas y se dan algunas tarifas típicas del empleo de puertos y sus instalaciones.

Los autores pasan a ocuparse de los distintos sistemas de mercadeo de pescado en los Estados Unidos, y mencionan brevemente el mercado al por mayor de la ciudad de Nueva York. Explican los métodos de venta en los principales puertos con especial referencia a los de Boston, Massachussets; Gloucester, Massachussets; New Bedford, Massachussets; Seattle, Washington y en la industria del menhaden.

Describen con algunos pormenores asuntos como la regulación de la calidad, servicios de mercado comunes y el Servicio de Información de Mercados de la Oficina de Pesca Comercial de los Estados Unidos.

Concluye la ponencia bosquejando los programas continuos de construcción y mantenimiento de puertos. Es difícil determinar los gastos exactos, pero en el presupuesto del Cuerpo de Ingeniesor del Ejército de los Estados Unidos, para 1965, el Capítulo "Puertos y canales costeros" se elevaba a 589 millones de dólares (245 millones de libras esterlinas).

THE task of relating a meaningful description of the overall fishing port structure and marketing system for fish and fish products for a country as large and varied as the United States with 24,640 km (15,400 mi) of coastline presents some special problems. The problems stem from the multiple use of harbour and port facilities on the one hand and the vast array of harbour sizes and types on the other. Coupled with these are the problems associated with a vast, complex and dynamic marketing system designed to deal with fresh, frozen and processed fish products. The mass with which we are dealing is a country composed of a land area of 9,065,000 km^2 (3.5 million mi^2); with a coastline of 24,640 km (15,400 mi) of which 6,520 km (3,700 mi) are on the Atlantic Ocean and Gulf of Mexico, 12,160 km (7,600 mi) on the Pacific Ocean, 1,760 km (1,100 mi) of Alaska coastline, and 4,800 km (3,000 mi) on the Great Lakes. To treat the assigned subject therefore, the approach herein is designed to deal sufficiently in generalities to convey the broad picture and to provide sufficient examples and detailed descriptions to reveal specific situations and examples.

Landings

Landings of fish and shellfish by United States' fishermen in 1967 totalled 4,061.0 million pounds liveweight basis valued at $438.3 million (£182.5 million). The catch was 880.6 million pounds less than the 1961 to 1965 annual average. The catch was valued at $34.0 million (£14.2 million) 16 per cent more than the value of the annual average catch of the previous ten-year period. These data show a generally declining volume of total landings which are of higher value than those of recent years. The overall total however does not clearly reflect the true nature of the landings, for there are divergent trends in landings by species. Ranking highest in United States landings in 1966 were: menhaden (30 per cent), salmon (8.9 per cent), crabs (8.5 per cent), tuna (6.2 per cent), and shrimp (5.5 per cent). In contrast on a value basis the five highest ranking were: shrimp (20.4 per cent), salmon (15.6 per cent), tuna (9.5 per cent), crabs (9.5 per cent) and oysters (7.0 per cent).

Manpower, fleet and fish plants

Employment by the fish industry in all positions in 1966 totalled 224,384 individuals. This was composed of 135,636 fishermen and 88,748 shore workers. In recent years the number of persons employed by the industry has declined. Peak of employment appeared to occur about 1950 when 263,478 persons were employed.

The number of craft operated by fishermen in 1966 totalled 82,122 of which 12,677 were vessels of five net tons or larger. There appears to be an upward trend to the number of vessels being used. In addition, there has been a definite shift to vessels of larger size in recent years.

Plants producing canned and industrial products totalled 663 (exclusive of duplication) in 1967. Of these, 309 processed and canned fish products, 142 were involved in the manufacture of industrial products, and 235 produced fresh and frozen fillets and steaks.

Principal fishing ports

A compilation of all places in the United States where fish are landed has not been made for there are numerous small ports, docks and landing facilities where fishermen off-load fish. For instance each remotely located firm or fish dealer may have private docking facilities where fish and shellfish are landed and processed for fresh sales direct to consumers or retailers or sold for processing. There are however some major ports for which data are compiled and reported. Listed in Table 1 are 17 of the largest ports in terms of volume of fish landed.

The port with the largest volume was San Pedro, California, with landings amounting to 310.5 million pounds. This port is primarily noted for tuna landings but also anchovies and mackerel are landed in relatively large quantity. A large fish canning complex is located in the area. The port of San Pedro not only is the leading port in terms of volume but was also in terms of value

TABLE 1. LANDINGS AT CERTAIN UNITED STATES PORTS, 1967

Port	*Pounds* (*thousands*)	*Dollars* (*thousands*)	*Important species*
San Pedro, California	310,520	28,598	Tuna, anchovies, mackerel
Pascagoula-Moss Point, Miss.	213,480	5,200	Menhaden and other industrial fish
Cameron, Louisiana	182,600	4,800	Menhaden and shrimp
Beaufort-Morehead City, N.C.	151,400	3,900	Menhaden and shrimp
Reedville, Virginia	143,500	*	Menhaden
Dulac-Chauvin, Louisiana	116,100	7,100	Menhaden and shrimp
New Bedford, Massachusetts	115,650	15,654	Flounders, haddock, sea scallops
Kodiak, Alaska	111,000	10,000	King crab, salmon, halibut
Empire, Louisiana	106,300	4,000	Menhaden and shrimp
Gloucester, Massachusetts	83,000	5,220	Whiting, ocean perch, haddock
Boston, Massachusetts	77,800	9,434	Haddock and cod
San Diego, California	62,153	8,054	Tuna
Point Judith, Rhode Island	57,600	1,643	Industrial fish
Portland, Maine	47,600	2,000	Ocean perch and lobster
Rockland, Maine	44,000	1,800	Ocean perch and lobster
Brownsville-Port Isabel, Tex.	34,000	16,500	Shrimp
Provincetown, Massachusetts	18,538	1,159	Whiting
Total	1,875,241	125,062	

* Data not available

Source: Branch of Fishery Statistics, Bureau of Commercial Fisheries, United States Department of the Interior.

with landings valued at $28.6 million (£11.9 million) in 1967. Boston, Massachusetts has also been a leading fishing port in the United States. It is noted primarily for landings of haddock and cod. In recent years Boston has declined in relative importance as a United States fishing port. In 1967, 77.8 million pounds of fish worth $9.4 million (£3.9 million) were landed at Boston. It was the leading United States fishing port in terms of value from 1927 until 1943. Since the end of World War II, international competition has influenced the decline in landings at this port.

Ports landing industrial fish are usually high volume but low value ports. Typical among these are Pascagoula-Moss Point, Mississippi; Cameron, Louisiana; Beaufort-Morehead City, North Carolina; Reedsville, Virginia; Dulas-Chauvin, and Empire, Louisiana. Landing principally higher value food fish among the leading fishing ports are New Bedford, Massachusetts; Kodiak, Alaska, and Boston, Massachusetts.

Although there can always be improvement, the port system as a whole is adequate. A national effort by the United States Army Corps of Engineers to provide, protect, and maintain the navigable ports has been carried on for almost one and a half centuries. Standards are high. The Corps has developed, by dredging and the construction of locks and dams, some 35,200 km (22,000 mi) of inland and intracoastal waterways, including the Great Lakes connecting channels and the United States portion of the St Lawrence Seaway. About 30,400 km (19,000 mi) of these waterways are currently in commercial use and carry approximately one-sixth of the total ton-mileage of the Nation's intercity freight It has improved almost all of the coastal, Great Lakes, and waterway ports and harbours through which the United States carries on its vital waterborne domestic and world trade. In fact, all our major Atlantic coast harbours are man-made. In addition to some 500 commercial harbours it has built about 250 small-boat harbours (United States Army Corps of Engineers, 1967). The United States' fishing industry also benefits as a result of these activities.

The recent trend of the fishing industry is to use fewer ports for domestic landings. Fish and fish product imports are increasing. Fish block imports are levelling off, but the quantity of packaged fish and shellfish as well as the number of countries exporting to the United States are increasing. Imports from Mexico and Canada are entering in increasing quantities via motor truck. Expansion of facilities to process fish blocks into fish sticks and portions is being accomplished at inland points at a greater rate than at sea coast facilities. These trends are not because of inadequacy of ports, but because of the economics of the distribution system.

The physical adequacy of the infrastructure—roads, railroads, and air service is among the most advanced anywhere. It seems safe to say that all residences and business firms have access to public all-weather highways. There is a national system of interstate highways that will soon be 65,600 km (41,000 mi) in total length. The routes are so located as to connect as directly as possible with principal metropolitan areas, cities, and industrial centres as well as connect at border points with routes of continental importance in Canada and Mexico.

Both the network of ports and the supporting distribution infrastructure are physically adequate. These two factors are probably the least important as problem causing factors in getting the fish from the sea to the consumer. Factors that are more of a problem are service handling equipment, and, for fresh fish, containers that will fit into the transport system.

Transport problems

As the American distribution system becomes more sophisticated, it becomes more and more difficult to obtain service for small shipments. This is compounded when the small shipments are perishable. For example, when there was nation-wide passenger-train service to most all of the communities, each train had an express car with a messenger. Iced fresh fish in the car was under the watchful eye of the messenger. He could make provision for the ice-melt and when necessary would make arrangements for re-icing. The passenger traffic has been diverted. Today the auto and the air-plane are used predominantly. The passenger trains service has been curtailed so drastically that there is no longer nation-wide service in rail-express cars. The express company must now use motor trucks and make drastic changes in its distribution system. The company has divided the country into areas and selected a "hub" terminal near the centre of each area. The originating area traffic is moved on radial routes to the "hub", transferred to large truck-trailers or express cars for a particular destination "hub" where it is transferred again to small trucks and moved on radial routes to ultimate destination. In this system iced fresh fish can no longer be shipped in wooden boxes that allow the ice-melt to drip out. Also there are no longer provisions for reliably inspecting and re-icing. The Bureau of Commercial Fisheries has designed a box that will not leak and is insulated to retard the melt. Tests show that the product can remain cold for up to five days and that it can be shipped along with frozen food and the product will not freeze. Future tests are needed to gain carrier acceptance and box manufacturers must be encouraged to produce the box. The box is made of wax-impregnated fibreboard. A polyethylene bag is put into the box with the lips of the bag placed over the edges. Foamed polystyrene slabs are inserted in the bottom and four sides. The fish prechilled to 33°F is packed in the box and ice is added. The bag is twisted closed and secured with a wire tie. This prevents spillage if the package overturns in transit. A sixth slab of foamed polystyrene is placed on top. The box is closed and banded. The aim is to perfect a self-contained refrigerated box that can move in air, motor, or rail transport without re-icing.

GOVERNMENT ROLE IN HARBOUR DEVELOPMENT

There are many Federal Government technical assistance programmes from which the United States' fisheries reap benefits of varying degrees. The Bureau of Commercial Fisheries (BCF), in the Fish and Wildlife Service of the Department of the Interior, has the primary responsibility to assist the fishing industry, but there are many other Federal and co-operative Federal-State assistance programmes from which members of the industry may seek help. Among these are the United States Army Corps of Engineers, the United States Coast Guard, the Department of Transportation and the United States Department of Commerce. An aid to the successful development of fisheries has been the advantage of good harbour facilities.

The maintenance of ports

The Corps of Engineers, United States Army, Department of Defense has had the responsibility since 1824, to provide and protect harbours, navigable waters, and inland waterways. Here again the total concept is used. The efforts are toward multi-purpose rather than a single purpose port. The Corps is not primarily concerned with docks and appurtenances, but with navigation of channels, and protective breakwaters and waterways. The fishing vessels benefit from this work because deep enough water is provided for docking and navigation. Protective harbours are planned for emergency retreat. Turn around time between trips is improved. For new or improved facilities, State and local officials, after consulting the nearest district engineer, may request authorization for surveys through their congressmen. Federal funding of planning and construction projects requires specific congressional authorization. Congress holds hearings on specific proposals at which interested parties may be heard. Where feasible and beneficial to general public, congress may pass the project legislation. Congress not only considers the initial planning and construction but usually authorizes continual maintenance of the development.

The United States Coast Guard, Department of Transportation, inspects vessels and personnel for safety; provides aids-to-navigation on navigable waters and waterfront facilities; provides rescue operations; controls movement and anchorage of ships and access to vessels and ports; and provides waterfront fire prevention facilities. It enforces the Oil Pollution Act to protect humans, fish, and wildlife from water pollution and contamination.

Financial aid

The main governmental financial assistance for docks, appurtenances, and facilities at ports comes from or is spearheaded by local governments. It may be city, State, or a combination of cities and States. Some Federal funds are available for port facility development and usually the local government is the applicant. For example, the Economic Development Administration, Department of Commerce provides technical assistance and public works in areas with severe unemployment. It helped rebuild the important fishing port of Seldovia, Alaska, after the 1965 earthquake. It has conducted several feasibility studies for improving fishery facilities and made loans for ocean access docks and processing plants. Local governments handle at least the protective, safety, and sanitary responsibilities of the on-shore facilities. They may also request the assistance of the Coast Guard for on-water police, and fire protection work.

Harbour administration

The harbour terminal activity may be administered by a quasi-government port authority. The structure of the port authority varies from community to community. It may be composed of State and local representatives, a combination of county and city representatives, be represented by several counties, cities, or may be the whole concern of any one of these. The authority is usually a self-perpetuating entity. It borrows capital, issues stocks, constructs facilities, provides services, recapturing costs through rentals and charges. Some may provide just the physical facilities and the administration is handled by a private contractor. It may be very complete by providing the personnel, handling equipment, warehouses, and even the promotional input assisting the users.

Usually port communities will have at least a municipal or public pier and public small boat anchorages, but the port facilities will be predominantly used by entrepreneurs with a small amount of selective contract used. Many fishery processing plants are located close to the public navigable waters. The plants have adjacent docks where fishery vessels land their catch, the catch is sold or factored to the plant.

PORT CHARGES

Most fishing ports of the United States have no formal tariffs or charges for the use of the waterways. Harbours are developed and maintained by the Federal Government strictly from tax supported revenues. In some communities fishing vessels are provided docking facilities without charge while loading supplies and off-loading their catch. On the other hand vessels docked for extended periods in these communities are assessed docking fees and in some communities all vessels must pay a wharfage fee regardless of the conditions of use. Sometimes, even though a facility is privately owned one or more piers are designated for public use. Little if any fee is collected for use of a public pier. It is not uncommon for private facility owners to expect vessel owners to purchase supplies from their ship's stores and to sell their catch to or through the pier owners. Some fishery ports have a "public authority" which provides the pier, offers shoreside rental space and publishes rental rates for shoreside and dock space. For example, at Brownsville, Texas, the authority—Brownsville Navigation District (BND) assesses charges for:

(a) Seafood buyers at $1.00 (10s) per front foot per month for dockside space and $.50 (5s) per front foot per month for space not adjoining the water. For non-frontage space $900 (£375) per year per acre
(b) Vessel owners pay $3.75 (£2) per hundred pounds for unloading shrimp, plus $7.00 (£3) a month for guard service
(c) Fish houses pay $30 (£13) a month for guard service.

The BND makes or pays for maintenance and repair of the docks, collects the garbage and trash without fee for vessels using facilities, and makes arrangements for all utilities for which the user is billed directly by the utility company. All buildings are constructed and maintained by the firms renting space from the BND.

At Point Judith, Rhode Island, the piers are owned by the State. Fishing and port vessels are charged $2.00 (£1) a day for vessels under 15 m (50 ft) and $3.00 (£1 10s) a day for vessels over 15 m (50 ft). Monthly rates vary according to vessel length and pier size, Table 2.

TABLE 2. MONTHLY DOCKING FEE FOR VESSELS AT POINT JUDITH, RHODE ISLAND, 1967

Length of berth m (ft)	*1.2 m (4 ft) Wide Pier*	*1.8 m (6 ft) Wide Pier*
	Dollars per months	
Up to 13 (40)	5.00	8.00
13 (40) to 14 (44)	5.50	9.00
14 (44) to 15 (46)	6.00	10.00
15 (46) to 17 (52)	6.50	11.00
17 (52) to 19 (56)	7.00	12.00
19 (56) to 20 (60)	7.50	13.00
20 (60) to 21 (64)	8.00	14.50
21 (64) to 22 (68)	8.50	16.00
22 (68) to 24 (72)	9.00	17.50
24 (72) to 25 (76)	9.50	19.00
25 (76) to 27 (80)	10.00	20.50
27 (80) to 28 (84)	10.50	22.00
28 (84) to 29 (88)	11.00	23.50

Source: Fishery Market News Service, Boston, Massachusetts.

MARKETING CHANNELS

Fish and fishery products move through a variety of market channels from the points of landings to the consumer. The market channels principally utilized to market fish and fish products depends to a large extent upon the type of fish, location or area of the country in which it is landed and to some extent the season of the year. In the North-Eastern area of the United States centred on Boston is located a groundfish industry. The market channels for fresh and frozen fish in this area and for this type of fish are shown in fig 1. The author points out that, "Dealers and chain stores are principal purchasers of fish at ports. They may process the fish into fillets or sell them whole. The larger dealers distribute fish through their own brokers in key cities to jobbers who supply the retail trade. Others sell through independent brokers to wholesalers and retailers. Some dealers ship directly to institutional buyers and retail stores, occasionally on a "cash and carry" basis. They also supply "secondary" wholesalers and processors who move fish to the retail dealer. Some chain stores handle the fish from the pier to their own retail outlets" (White, 1954).

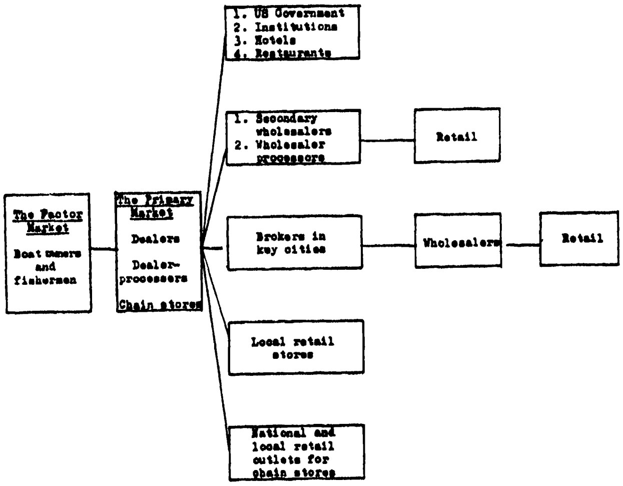

Fig 1. The chain of markets for New England fresh and frozen fish

A study made by Gaston and Storey involved a more detailed analysis of market channels for fresh fish originating at the Boston Fish Pier (Gaston and Storey, 1967). This study dealt with haddock, cod, pollock, and flounder. Of the fish shipped and included in this study most of the haddock were sold as fillets. Pollock was sold fairly commonly in either fillets, steaks or whole form, Table 3.

TABLE 3. RELATIVE IMPORTANCE OF DIFFERENT PRODUCT FORMS FOR FOUR SPECIES OF FISH, 1964

Product form	*Haddock*	*Flounder*	*Cod*	*Pollock*
		(thousand pounds)		
Fillets	3,367	296	364	113
Steaks	0	0	500	105
Whole	1,087	374	172	67
Total	4,454	670	1,036	284

Source: "The Market for Fresh Fish that originate from Boston Fish Pier Landings." *Recent Developments and Research in Fisheries Economics*, Edited by F. W. Bell and J. E. Hazelton, Oceana Publications, Inc., Dobbs Ferry, New York, 1967.

Gaston and Storey also studied the types of firms that handled fish. "Overall, about 40 per cent of the fish was handled by some type of immediate wholesaler while most of the remainder, 60 per cent, went directly to the final recipient" (fig 2). Wholesalers and wholesaler-retailers were more in areas outside the New England area than in nearby markets, Table 4.

TABLE 4. RELATIVE IMPORTANCE OF DIFFERENT INITIAL RECIPIENT CLASSIFICATIONS IN FOUR MAJOR REGIONS OF THE UNITED STATES (AUGUST 1964, DECEMBER 1964, AND MARCH 1965 COMBINED)

Recipient classification	*Geographic Region* *New England*	*North East*	*South East*	*Mid West*	*All regions combined*
	(per cent of receipts in region)*				
Institutions	2	2	7	12	2
Wholesaler-retailers	4	31	—	—	19
Wholesalers	2	35	11	1	21
Retailers	88	18	7	33	48
Restaurants	4	8	75	54	7
Specialty outlets	†	6	—	—	3
All classes combined	100	100	100	100	100

* Based on shipment weights, with duplication removed.
† Less than 0.5 per cent.

Source: "The Market for Fresh Fish that originate from Boston Fish Pier Landings." *Recent Developments and Research in Fisheries Economics*, Edited by F. W. Bell and J. E. Hazelton, Oceana Publications, Inc., Dobbs Ferry, New York, 1967.

Sixty-six per cent of the fish in the north-east region were handled by wholesalers and wholesale-retailers as compared with only six per cent in the New England area. The authors believed that a minor part of this difference in types of dealers by areas stemmed from differences in types of respondents but that by and large this is a true pattern. In turn fish distribution by the wholesalers and wholesaler-retailers was explained. The wholesaler-retailer retailed 36 per cent of the fish they handled and

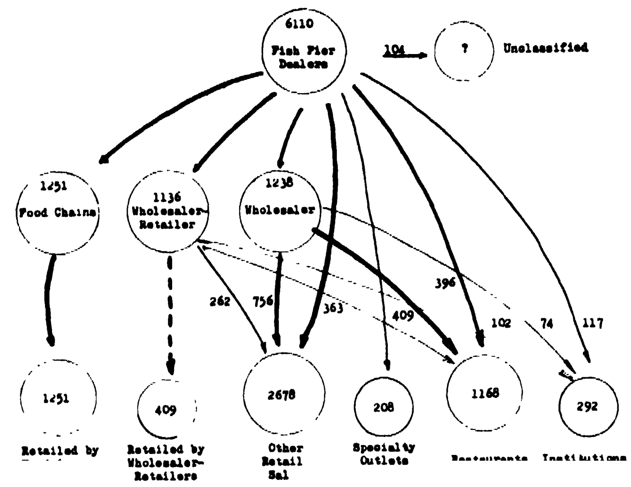

Fig 2. Composite marketing channels for fresh fish (thousand pounds shipped). Source: "The Market for Fresh Fish that originate from Boston Fish Pier Landings". Recent Developments and Research in Fisheries Economics, *ed. F. W. Bell and J. E. Hazelton, Oceana Publications, Inc., New York, 1967*

of their wholesale sales, 36 per cent went to other retailers, 50 per cent to restaurants and 14 per cent to institutions. The wholesalers sold 61 per cent of their fish to retailers, 33 per cent to restaurants and six per cent to institutions (fig 2).

Estimates of volume of sales of fish moving through the various types of firm were made by the authors. Based on 2.1 million pounds of fish, 61 per cent were sold by retail grocery stores and 39 per cent were sold by retail seafood markets. Another 2.2 million pounds included sales to retailers by wholesalers and wholesale-retailers and direct sales to retailers by four Boston Fish Pier dealers. About 24 per cent of the Boston fish were handled by restaurants and institutions. In addition the authors estimated that another 24 per cent of the Boston fish marketed was sold as fried fish to eat off the premises. This plus the fish prepared in restaurants and institutions results in about one-half of all Boston fish reaching the consumer in cooked form.

Another indication of marketing methods for fish is the movement of fishery product shipments out of Seattle, Washington in 1967. Shipments totalled about 45.0 million pounds, of that total truck shipments accounted for 35.0 million pounds or 77 per cent, rail express car shipments totalled 8.0 million pounds or 19 per cent, and air transportation about 2.0 million pounds or four per cent. Of the 45.0 million pounds shipped from Seattle, approximately 40.0 million pounds was frozen fish and shellfish and the remainder was in the fresh form.

Inland wholesale markets

The wholesale terminal fish market represents another important link in the fish marketing chain. An example of a wholesale fish market is the Fulton Fish Market in New York City which is the largest and most important wholesale food fish market in the United States. It receives more than 150 varieties of fish and shellfish and exerts considerable influence on other markets throughout the country because of its ability to handle large volumes of various kinds of fishery products. It is also an important centre for considerable volume of fresh-water fish and frozen processed ocean fish from Canada. Nearby are the offices of brokers and dealers handling imported fishery products entered through the New York Metropolitan Customs District. It receives fishery products by truck, rail, air, and steamship, and there are some landings at the Fulton Market docks by fishing craft which land species such as scup (porgy), butterfish, fluke and eas scallop meats (shucked aboard from shell stock).

Receipts of various types of fishery products marketed through the New York metropolitan area in 1967 totalled 410.0 million pounds. Of that total, 167.0 million pounds were received at New York City's Wholesale Fulton Fish Market and the remainder of 243.0 million pounds consisted of imported fish and shellfish entered through the New York Customs District. Landings by fishing vessels at the New York docks in 1967 accounted for an additional 3.0 million pounds. The two major species landed during the year were scup and scallops. By type of transportation, trucks accounted for 93 per cent of the receipts at the Fulton Fish Market, rail express less than one-half of one per cent, rail freight about five per cent, and vessel landings two per cent.

METHODS OF SALE

Most sales of domestic catch are made through negotiations between the seller and buyer. The former being the vessel owner or captain and the latter usually a fish wholesale dealer, or processor. Where the fishing vessel is owned by a processor, or fish dealer or where the vessel is financed by a dealer or processor, the fishermen are usually obligated to sell the catch to the dealer or processor at the market price for the particular day.

Some ports provide sales rooms for fishermen where buyers and sellers of fish meet to consummate sales or where sales may be made by telephone. Fish auction is a method of fish sales found in some ports. In Boston, for instance, a fish auction is operated under strict rules and regulations as prescribed for the New England Fish Exchange. According to the "Rules and Regulations"; "The Exchange is intended in general for the accommodation of all fresh fish dealers, whether wholesale or retail of good credit and business standing who wish to buy fish discharged by vessels on the Boston Fish Pier" (Rules and Regulations, 1935). The auction method of fish sales usually attracts relatively large numbers of buyers and sellers of fish thereby helping to establish a reliable market place for fish.

Contract selling is a common sales method in some fisheries In this type of selling a price is negotiated in advance of the catch. In addition to the negotiated price a contractual agreement usually specifies quantities to be taken by the buyer, quality of the product, delivery point, etc. A contract usually is negotiated by an individual or group representing one or more fishermen who are members of a fishermen's organization. In some instances a method of determining a fair market price is specified in the contract rather than a specific price for an entire period. Isolated fishermen and dealers may agree to base the sales price on an accepted distant market price plus or minus an average differential according to quality of product, and local supply and demand conditions.

The consignment method of selling fish is practised on a very limited basis. In this method, fishermen ship fish to a broker or dealer in a distant market who negotiates the sale of the fish. The seller receives a commission for his services and the fish owner receives the sales value minus the dealer's commission. The consignment method of selling has been declining over the years. An average commission by a dealer would amount to about 15 per cent of the price.

Description of some of the sales methods commonly found in some ports and others that are usually identified with a particular fishery may help to understand fish pricing systems employed in the United States. The following descriptions were taken from a report by the Organization for Economic Co-operation and Development, "Council Study of Price Systems in the Fishing Industries of Member Countries," Paris, 10 March 1966, C(66)1 Part 11, Scale 1.

Boston

Landings are made at Boston Fish Pier and Atlantic Avenue Wharf, the latter being on a much smaller scale than the former but having a different method of price determination. Most of Boston, Massachusetts', 62 trawlers discharge at the Fish Pier and their catches are sold in the New England Fish Exchange selling room by auction. The Exchange is a private corporation operating by a decree of the Federal Court. It undertakes the recording of all sales transactions, collection of monies and payment to vessels, deducting a fee of one per cent of the gross value of a cargo for its services. Four commission firms provide the auctioneering service paid for by owners of the catch and the buyers are the 40 member-firms of the Exchange who pay an annual membership fee of $75 (£31) plus $50 (£20) for each extra buyer. Sales start at 07:30 and cargoes are sold by species beginning with haddock. Thus the haddock content of all vessels in ports are disposed of before going on to the next species and more or less simultaneous discharging can commence, allowing the processing plants to start operations at about 08:00.

The buyers, who bid on the "hailing fare" (the skippers' estimate of the weight of the catch) do not see the fish before purchasing and can refuse to take delivery if, during discharge, the quality of the fish falls below "first grade". In this case, the rejected portion of the catch is again offered for sale. Vessel owners cannot bid for fish offered by their own vessels but can refuse the highest bid if it is not acceptable. There are no fixed minimum prices.

Gloucester

There are over 20 processing firms at Gloucester, Massachusetts, principally engaged in the preparation of ocean perch fillets and headed and gutted whiting for the large North eastern wholesale markets.

The fishermen's union operates a selling room, with a union representative acting as agent for the fishermen in the sale of ocean perch. A buyer must agree to pay for an entire cargo and, although he may sub-contract with others, settles directly with the vessel. Expenses connected with the selling room are borne by the union.

Whiting catches are also sold in their entirety but here the price is negotiated directly between fisherman and merchant as are the prices for other species. Some small trawlers box their catches and send them direct to wholesale markets in New York and other major distribution centres.

New Bedford

As in Gloucester, Massachusetts, the fishermen's union operates a selling room in New Bedford, Massachusetts, situated in a municipally owned building, with union agents acting as auctioneers. No fee is charged by the union for selling. There are about 175 vessels in the New Bedford fleet.

Sales of scallops start at 07:00 and end when a bell rings at 07:30. Flounder and other groundfish are sold between 08:00 and an 08:30 bell. The merchant offering the last bid on any species before the bell rings becomes the buyer and settles directly with the vessel. The buying firms are those with docking facilities and they may resell part of their purchase to processing plants elsewhere in the town.

At other less important ports in New England the most prevalent method of selling is by direct negotiation between buyer and seller.

The Menhaden fishery

Menhaden vessels are usually owned by firms engaged in the production of meal and oil from the fish and crews are paid according to their catch. The amount paid to the fishermen does not, therefore, include the costs of the vessel, seine boats, net and much of the operating expenses, these being borne by the owners. The fishermen's remuneration varies with the volume of fish taken during the season and can include bonuses, etc., for fishermen who stay with the vessel for an entire season. Menhaden fishermen are not strongly unionized. When paying for a catch from a vessel owned by another company the buyer computes the price at 60 per cent of the value of the menhaden products produced from the catch.

Seattle

The Seattle Fishermen's Exchange is a halibut fishermen's organization operated by vessel owners and halibut fishermen to sell halibut trips at auction to Seattle wholesale dealers. The auction is operated by the manager of the Fishing Vessel Owners Association and the Secretary-Treasurer of the Deep Sea Fishermen's Union.

During the Pacific halibut fishing season (April to October), halibut vessel fares are sold at auction each day in an Exchange Room located on a Seattle pier. The vessel name and halibut hauls must be posted on the Exchange board by 08:30 if it is to sell at auction on that day. The names of Seattle wholesale dealers are posted alphabetically across the top of the board. Bids are made in cents and tenth-of-cents per pound for sizes of halibut classified as chicken, medium and large (dressed heads-off weight basis), and two per cent of the weight is deducted for ice and slime. The minimum bid is one-tenth cent per pound or $10 (£4), whichever is larger. Only one auction is held each day, except on Fridays, when an afternoon auction is held at 15:00 for vessels arriving too late for the 08:30 posting.

There is no true auction for trips of troll-caught salmon. Presently, the salmon caught is sold by contract to one firm for the entire season; contract is awarded to the highest wholesale firm bidder at the beginning of the season.

In South-East Alaska ports of Juneau, Ketchikan, Pelican, Petersburg, Sitka, and Wrangell, both halibut vessel deliveries and troll-caught salmon landings are sold at auction in a single exchange room in each port. Bidding starts at 09:00, with minimum bid increases for halibut at one-tenth cent per pound, and for salmon the minimum bid unit is one cent per pound.

QUALITY CONTROL

Considerable effort is expended in maintaining the quality of fish and fish products as they are moved through the marketing system from the fisherman to the consumer. In addition to minimizing the retardation of quality during transit through refrigeration, many processors of fish products have individual firm quality control programmes applicable to their products and the United States Department of the Interior, Bureau of Commercial Fisheries provides an inspection service on a fee-for-service basis. The inspection service is impartial and applicable to fresh, frozen, canned, and cured products. Inspections help fishermen, dealers, and processors to determine whether the terms of contract or purchase orders are fulfilled; may supplement processors quality control programmes; helps to establish the inventory loan value of the product on-hand and to settle claims for damages which occur in transit. To facilitate the inspection programme United States Grade Standards have been developed by the United States Department of the Interior for some fourteen different fishery products. (Fishery Products Inspection, 1965)

COMMON MARKET SERVICES

Common market services offered fishermen are principally a function of co-operatives or unions. The Fishery Co-operative Marketing Act of 1934 establishes requirements and limits within which fishery co-operatives may organize and operate. Fishermen may organize to carry out any or all production and marketing functions on a common basis. These may include financing vessels, pooling of the landings for advantages accruing through volume of sales, transportation, processing or storage. Some co-operatives also provide common services through the purchase of fishermen's supplies of all types, and the joint use of fishermen boat repair facilities, gasoline and oil sales and boat parts. Fishermen's unions often help fishermen provide joint-use facilities such as fishermen's sales facilities. Common arrangements for containers are unusual. The wide distribution of fish, the high cost of container management and return of empty containers have thus far precluded the use of commonly owned re-usable containers. The trend is rather toward disposable fibreboard containers.

MARKET INFORMATION

The Market News Service of the United States Bureau of Commercial Fisheries collects and disseminates regularly and promptly accurate and complete marketing information on fishery products and by-products, current trends, developments, and research findings in this country and foreign countries of interest to the fishery and allied industries of the United States.

The Bureau's Fishery Market News Service is thirty years old, having been established in November 1937 soon after the first funds were appropriated by Congress for "collecting, publishing, and distributing, by telegraph, mail, or otherwise, information on the fishery industry, information on market supply and demand, commercial movement, location, disposition, and market prices of fishery products".

The major overall policy of the Fishery Market News Service is to provide daily or current unbiased and accurate market data that fishermen, vessel owners, the fish trade, and the fishing and allied industries are not capable of providing for themselves.

The first Fishery Market News Service office was established in New York City in November 1937. There are now eight such field offices, seven of which publish and mail daily mimeographed reports entitled Fishery Products Reports. These field offices are located at important fish landing ports, principal wholesale market centres, or processing areas—Boston, Massachusetts; New York City; Baltimore, Maryland; Hampton, Virginia; New Orleans, Louisiana; Chicago, Illinois; Terminal Island, California; and Seattle, Washington.

The three major objectives of Market News are to:

(a) Provide the fishing industry with current information on landings, receipts, prices, demand, market, stocks, imports and exports, and new developments in domestic and foreign fisheries that are needed for the orderly marketing of fishery products and by-products.

(b) Act as a clearing house and disseminate information on fishery studies and research by states, federal agencies, and others

(c) Act as a clearing house and disseminate information on new publications or articles related to fisheries, and legislative actions by Congress.

The market information published by the Market News Service is picked up by trade periodicals, radio stations, newspapers, public relations and other business firms. Ultimately it reaches an audience considerably larger than that indicated by the Market News mailing lists. The Market News Service Fishery Products Reports are mailed to about 10,000 subscribers in the United States, Canada, Latin American countries, and many other foreign countries. These reports are mailed free by regular surface mail. Some subscribers both in the United States and in foreign countries wish to receive them by air mail and pay for the postage costs involved.

The information published in Market News reports accomplishes the following:

(a) Aids in the effective and orderly distribution and fair pricing of fishery products and by-products, and facilitates trading because it is unbiased and accurate

(b) Places fishermen, dealers, processors, brokers, commission agents, and retailers on an equal bargaining basis, and provides for pricing on a broader pattern than just a single market area

(c) Helps to determine markets to which to ship in order to obtain better distribution and more profitable returns, and thereby prevents gluts and shortages

(d) Permits a firm, individual, or organization to make intelligent and profitable buying, selling, investment, and management decisions based on actual developments

(e) Provides essential information for use by municipal, State and Federal governments in legislation and executive decisions

(f) Provides essential price series and other marketing data for researchers and analysts

(g) Aids in determining past, present, and future developments in price, production, transportation, storage, and foreign trade

(h) Supplies basic data for determining the proper utilization for United States fishery resources and the place of fisheries in the economy

All of the information collected by the Fishery Market News Service is obtained on a completely voluntary basis and it is never reported in such a way as to reveal the operations of a single enterprise. Nor is information received in confidence made available to tax or enforcement agencies. The Service has no legal authority to demand the information it obtains from fishermen, wholesalers, processors, transportation agencies, and others. It operates successfully because it has been able to evoke a spirit of co-operation in the industry and has demonstrated that the results justify the fullest assistance.

PORT MAINTENANCE AND DEVELOPMENT

The continuous programme of harbour development and maintenance carried out by the United States Army Corps of Engineers applies to both major and minor harbours and therefore provides adequate channels for the movement of fishing vessels. Harbours are generally considered adequate to the needs of fishermen. However, where needed and proper justification is provided, the United States Army Corps of Engineers will provide dredging to support the development of new and maintenance of old commercial fish and shellfish channels and harbours. Natural harbours and channels are being progressively improved to provide for greater depths required for larger vessels. Depths of 11 m (35 ft) now generally exist at primary harbours on the Atlantic and Gulf coasts. Depths of 9 to 12 m (30 to 40 ft) exist on the Pacific coast. Channels and harbours of lesser depths have been provided for commercial fishing. It is difficult to ascertain the dollar amount spent in support of commercial fishing by the United States Army Corps of Engineers since all harbour and inland waterway development in some measure aids commercial fishing. As an indication, the Corps of Engineers' budget in 1965 for "Coastal harbours and channels" amounted to $589.0 million (£245 million).

Principal shortcomings of the system appear to exist within the port facility and beyond to the consumer. In some instances port facilities have become antiquated and have not kept pace with changing needs of the fishing industry. Principal shortcomings appear to be associated with handling of fish at the pier; fish sales techniques, where rigid terms of sale impede entrepreneur initiative and flexibility in the sale and handling of fish landings; and in the transport of fresh fish in small quantities.

No systematic continuous programme is underway to improve port facilities. However, port authorities are constantly striving to improve conditions, reduce costs, and expedite the movement of products. A recent project now pending approval, for example, would study and develop a comprehensive plan for a complete-service type model fishing port facility. The proposed project is the Port of Newport, Oregon. One objective of the study is to, "develop service and technology for a 'Model Fishing Port' for benefit of the national fishing community". The proposal envisions a port with all of the required service facilities, such as the proper kind and amount of ice, cold storage facilities, quick freezing facilities, a fish offal processing facility, boat sanitation facilities, modern fish off-loading techniques, gear repair and storage facilities and ideal dock and slip design. This project is pending approval of funds by the Economic Development Administration of the United States Department of Commerce. Total project cost would amount to $200,000 (£83,400).

A project recently approved by the Economic Development Administration provides $1.2 million (£500,000) in grants and a $1.6 million (£660,000) loan to expand port facilities in the Brownsville, Texas, area. Of this $720,000 (£300,000) will be used to expand the fishing harbour and local contributions will total $480,000 (£200,000). The project will include a new basin, improvement of docks and ramps, widening of a road, installation of street lights, sewer lines and a 1.0 million gallon water tank. Both of these projects are jointly financed by the federal and local governments. No international assistance is provided.

To facilitate the movement of small quantities of fresh fish, considerable work has been carried out toward the development of a leak proof container suitable for shipment by train, truck, and air. This work is being conducted by governmental agencies, by private fish industry groups, and by private transportation firms. These groups work co-operatively to help design the much needed containers.

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Billingsgate Inland Wholesale Fish Market, London

by C. Wiard

Le marché intérieur de gros à poisson de Billingsgate (Londres)

Bien qu'elle soit dépourvue d'un port de pêche, la petite ville de Billingsgate offre à un certain nombre de petits ports de pêche et aux importateurs des installations de base pour la commercialisation du poisson. Elle offre ainsi un marché pour les ventes à la criée qu'on pourrait difficilement trouver dans beaucoup de ports de pêche isolés.

Après avoir fait l'historique du marché intérieur de gros pour le poisson de Billingsgate (Londres), le document décrit la structure des bâtiments actuels, de même que les travaux récemment entrepris pour affronter l'augmentation considérable de la circulation routière. Le document décrit également les critères d'administration et de gestion du marché, de même que les services fournis par ces derniers, notamment les excellents systèmes de contrôle de la qualité des crustacés et des mollusques. Le document traite également du personnel, des opérations quotidiennes et du taux actuel des droits exigés. L'auteur attire l'attention sur la flexibilité des services offerts par ce marché et fait ressortir le vaste éventail de variétés de poissons vendus au cours de ces dernières années.

Mercado interno al por mayor de pescado de Billingsgate, Londres

Aún sin ser un puerto de pesca, Billingsgate proporciona los medios primordiales de comercialización a varios puertos de pesca poco importantes, y a las importaciones de pescado, actuando así como un mercado de subasta mejor que el que podrían constituir varios puertos aislados.

Después de exponer los orígenes del mercado interno al por mayor de pescado de Billingsgate, se describe la configuración de los actuales edificios y las recientes mejoras para hacer frente al considerable aumento registrado por el tráfico de carretera en estos últimos años. Se informa tambien de quién es el propietario del mercado, quién lo administra, los servicios que proporciona—como el control de la calidad de los mariscos, efectuado por los procedimientos más modernos—el personal del mercado, las operaciones diarias y las tarifas de los actuales impuestos. El autor subraya la flexibilidad de las disposiciones adoptadas por el mercado y las numerosas clases de pescado que se han vendido últimamente.

ALTHOUGH in most cases definition of a fishing port implies the provision of primary marketing facilities for the distribution of landings, there are many instances where the first sale and the transfer of ownership of the fish is located at some distance from the quayside. Such a terminal as New York's Fulton Market or Billingsgate Market in London can fulfil this essential port function for not one but many points of landing. Where transport between ports is available it may well be that such a centralized market is more efficient than a number of scattered ones, permitting a greater concentration of buyers and a wider variety of produce.

Although a large proportion of the sales in Billingsgate Market are secondary sales, having first been sold at the port, a very high proportion are first sales of fish sent on consignment by fishermen and by foreign exporters. The following description of the operation of a centralized fish market, although not now attached to a fishing port, is illustrative of the problems and trends in the purely marketing function of fishing ports.

Historical origin and evolution

Billingsgate is almost a foundation stone of the history of London and even in the 20th century much of its character and trading principles differ very little from the pattern of 1699 when the first Act of Parliament relating to the Market was passed, by which Billingsgate was made a "free and open Market for all sorts of fish whatsoever".

Early maps of the area show Billingsgate to be a dock or a clear inlet from the river which if it had been situated on the coast would no doubt have been considered a harbour.

As a port serving London, vessels discharged cargoes of all kinds and in the reign of Ethelred (866 to 871) laws for regulating customs dues on ships at "Blynesgate", then the only wharf serving London, were enacted. Later it would seem that Billingsgate was firmly established as a kind of Custom House besides a Port, for it is recorded that in 1385 the "Custom House was re-built". The fact that even today Billingsgtae and the Custom House are adjacent lends weight to this theory of transition.

With the passing of the Act of 1699, the Market became identified with fish only, the produce of the land no longer being handled at Billingsgate; whilst the main source of fish supply undoubtedly was the River Thames from the mouth to the upper reaches where even as late as 1810 salmon were known to have been taken.

From an open dock where the fishing vessels berthed, often with their bowsprits over the upper windows of nearby shops to an open space with no head shelter in 1800, a building bounded by the river on the South and Lower Thames Street in the North, with shops, stands, basements, offices, and giving complete protection from the elements would appear in 1850, to be the first attempt to erect a purpose built Market, the earlier erections being a multitudinous growth of odd assorted rough-hewn structures. A wooden roof, the introduction of gas lighting, the filling up of the Dock, and a new riverside frontage to the design of a Mr Bunning, with an Italian façade, were all effective improvements.

An improvement to the roof followed but very little was done to the Lower Thames Street frontage until the commencement of building of the present Market in 1874 Opened in 1876, the area of the Market was almost doubled by the acquisition of nearby properties. Electric lighting was introduced, facilities for shell fish boiling, and when completed Billingsgate was then considered the finest Fish Market in Europe.

SITE, LAYOUT AND FACILITIES

The area of the covered Market today is approximately 4047 m^2 (one acre) and is roughly square in shape.

On the East and West sides from the front entrances in Lower Thames Street to the rear of the Market, a total of 15 large shops are situated with basements and two upper floors of offices. These shops house some of the largest firms in the Market, some of which are family concerns which have held tenancies in the Market for over 200 years.

The central area of the Market is divided into Avenues for pedestrian traffic (retailers) and Stands for wholesalers. A Stand is a portion of the Market floor, presumably so-called because that is where the wholesaler stands. In area these range from 4.2 to 5.6 m^2 (45 to 60 ft^2) and whilst a small firm will be content to occupy one such Stand, larger firms may rent three or four as a complete unit.

Adjoining the Market and to the West is an area of approximately 4047 m^2 (one acre) on which formerly were a number of warehouses. When these became derelict they were demolished and the area purchased in 1936 for an enlargement of the Market. The advent of World War II however, prevented the improvements then envisaged; the area was cleared and made available for heavy vehicles which now bring fish to the Market.

With the end of the war came fresh thoughts of improvement, and after much careful consideration of the changing pattern of trade, principally that no fish was being delivered by way of the river and that all supplies travelled overland in some form or other, it was appreciated that the pre-war notions of enlarging the Market were no longer valid; instead, a greater area of parking space was needed.

The aforementioned area was resurfaced in 1961; an extension to the quayside, some 113 m (370 ft) long and 18 m (60 ft) wide was built over the River Thames, not as a quay for vessels, but to add to the area needed for parking; a new shell-fish boiling house was constructed, complete with stainless steel steam-heated boiling pans, and a steam extraction plant.

The scheme also provided a porters changing room with steel clothes lockers, shower baths washing and toilet facilities and a drying room for their working clothes.

Ten shops smaller in size than others in the Market were erected at the river end and finally a small dormitory was erected adjacent to the Parking Area for the use of drivers of vehicles arriving in the early hours of the morning, who, in many cases, have driven from a port 320 to 480 km (200 to 300 mi) distant.

OWNERSHIP AND MANAGING AUTHORITIES

Under various Acts of Parliament the ownership of the Market is vested in the Corporation of the City of London, who delegate their authority to a body of its member known as the Billingsgate and Leadenhall Markets Committee.

Bye-laws, Rules and Regulations for the control of the Market and activities therein are agreed by the Lord Mayor, Aldermen of the City of London and members of the Court of Common Council, who are also charged under an Act of Parliament with appointing a Clerk and Superintendent for the daily management of the Market.

The Billingsgate and Leadenhall Markets Committee meet once a month to receive and consider matters laid before them by the Clerk and Superintendent.

The agenda for such a meeting contains references to applications for tenancies of stands, shops or offices in the Market; the termination of such a tenancy—usually through retirement or ill-health of the tenant; details of the tenant; details of the monthly tonnage of fish passing through the Markets; details of staff—recruitment, sickness, retirements, promotions, etc; and visits to the Market by interested parties, etc.

ORGANIZATION AND ADMINISTRATION

The Market Bye-laws at present in force were sanctioned by the Board of Trade in 1876; amended in 1880 and 1907 supplemented in 1936 and 1940. All such amendments and supplements are approved by the Board of Trade

In the main these Bye-laws furnish the Clerk and Superintendent with authority to collect Tolls on all fish brought to the Market, to make charges on wholesalers for the occupation of stands, shops, etc., and to license and control porters.

The years since the adoption of such Bye-laws have seen many changes in the pattern of trade; methods of transport; handling and economics involved in maintaining the Market. It follows, therefore, that many of the present Bye-laws are out-dated and outmoded, and the need for complete revision is very urgent.

Since, however, plans are afoot for the possible complete rebuilding of the Market, after mature reflection it has been decided not to re-draft the Bye-laws until such rebuilding is complete and the type of regulations, orders etc., for the control of the Market activities in the new circumstances are clearly apparent.

All fish is brought to the Market by road vehicles, having been collected from nearby rail-heads, or having travelled direct from the fishing port.

Retailers attending the Market may either take their purchases away in their own transport or they may avail themselves of a delivery service operated by private transport contractors.

Sanitary inspection and maintenance of the buildings is the responsibility in the first instance of the Clerk and Superintendent, who, however, has the services of the Medical Officer of Health and the Surveyor for the Corporation of the City of London.

Quality control of fish

Various forms of quality control exist at all the sources of supply, both British and foreign ports despatching fish to London.

The daily inspection of fish at Billingsgate, however, is in the highly experienced hands of fish "meters" or inspectors of the Worshipful Company of Fishmongers, one of the oldest of the great Livery Companies of the City of London; the first chronicled records of a Guild of Fishmongers being earlier than 1154.

Various Charters from the reign of Edward I until that of James I have authorized the control exercised by the Company on fish entering London. In addition to these Charter powers, the Company has statutory powers under the Salmon and Fresh Water Fisheries Act of 1923, the Fisheries (Oyster, Crab and Lobster) Act of 1877 and the Sea Fishing Industry Act of 1938, authorizing prosecutions for illegal methods of fishing and of marketing during the closed seasons, or of undersized fish.

An important aspect of the Company's work is concerned with shellfish. Samples of all oysters, mussels, etc., coming to London from Great Britain and abroad are regularly examined and failure to reach the standard required by the Company results in the prohibition of sales and the institution of enquiries at the source of supply.

Whilst the Company's Charter applies only to the City of London, the benefit of its control in guarding against the spread of such diseases as typhoid fever extends to the whole country, for the Company's especial knowledge and experience is much sought after by other authorities within the kingdom This valuable service is rendered to the country at large and to the City of London and Billingsgate in particular, entirely without charge. The inspection of all supplies to Billingsgate if such were to be the responsibility of the Market Authority would undoubtedly involve an expenditure of several thousands of pounds per annum.

Market administration staff

The total number of staff attached to the office of the Clerk and Superintendent of the Market is 52. Of this number the office administration concerned with the letting of shops, stands; collecting of rents, tolls; the purchasing of materials for maintenance, etc., the recording of stocks of material; the payment of salaries and wages, and the keeping of statistics consists of one Principal Assistant to the Superintendent; four male clerical staff, senior and junior; one female clerical assistant (a combined secretary and telephonist) plus two male toll clerks whose duties consist of collecting and collating details of all fish being brought to the Market.

The protection of Market property, general law and order and adherence to the Bye-laws is enforced by the Market Constabulary, a force consisting of two Sergeants and 12 Constables who are sworn in as extra Constables of the City of London.

This private police force is under the direct control of the Clerk and Superintendent of the Market.

The day-to-day maintenance of the buildings is in the hands of a works foreman and a staff consisting of a plumber, painter, carpenter, drainman and two skilled labourers. A skilled engineer/electrician, and assistant and two stokers are responsible for operating and maintaining large solid fuel boilers for the provision of hot water, steam heating, the means of boiling shellfish and in general maintaining and cleaning the entire electric lighting system.

The staff also includes a foreman and eighteen men engaged in the daily cleaning of the market, including toilets, stairway passageways, and, most important of all the hosing down of the main Market floor.

Cleaning the market

This is completed in three stages. The initial foray into the Market is to collect broken boxes, pieces of wood, wire bands, etc. This is followed by a thorough sweeping of the area to remove fish offal, heads, guts, skins, etc., with which the floor becomes cluttered as a result of filleting for personal use by salesmen, porters, etc. Then the main cleaning agent is brought into use. Lengths of 7.6 cm (3 in) bore leather hose give a water pressure of 422 g/cm^2 (60 lb per square inch). Every square inch of the floor is subjected to a heavy concentration of water under high pressure and is cleansed of fish oil and fish matter.

CHARGES FOR USE OF PREMISES AND SERVICES

The main income is derived from the letting of shops, stands and offices to wholesalers and is augmented by a toll charge levied on all fish brought in, and to a lesser extent by a charge levied on Shellfish Boiling.

The present rent charges are a matter of negotiation but the Corporation of London as landlord does not seek to handicap the wholesaler with a rent which is an encumbrance to the business. The rent of stands in the Market is at the rate of 18 cents (1s 6d) per 0.09 square metre (per square foot) per week with 21 cents (1s 9d) for corner stands with two "selling frontages".

Tolls on fish is at the rate of 2 cents (2d) per 50.8 kg (cwt).

Office rents are subject to negotiation, but again are kept to a reasonable figure. In the large shops which include two floors of offices above and a basement below, the tenants are responsible for the rates on such property.

The General Rates of the whole Market are borne by the Corporation of London, together with the cost of lighting, water for cleaning, etc., the rents of stands being inclusive of rates.

TERMS OF BUYING AND SELLING

Wholesalers in the Market are classified as Inland Wholesalers who purchase their supplies in the British Isles from a port wholesaler or from an overseas exporter.

A relatively small amount of fish is sold on commission in Billingsgate on behalf of the Port Wholesaler, the Billingsgate man taking a percentage of the price obtained.

Initial enquiries as to the terms of obtaining fish from the coastal merchant or the overseas exporter would indicate that all sales are made at a fixed price. Whilst the original bargaining may conclude with a figure being agreed upon between the parties, such is their relationship after many years of contact by telephone each day, that a sense of mutual trust is created enabling the Billingsgate merchant to telephone the next day when sales are completed and inform his supplier that the "market" went against him and the fish realized such a low price that after deducing expenses and a small margin of profit for himself he will be obliged to return to the sender 12 cents (1s) or more per 6.4 kg (1 stone) less than the price formerly agreed upon.

This arrangement is totally acceptable both to British and overseas suppliers, who appreciate that the reverse position may result the following day, when 12 cents or so (1s) per 6.4 kg (1 stone) in excess of the figure previously agreed may be returned, should they have forwarded to the Market a variety of fish which was in short supply or when the particular consignment was of outstanding quality.

Whilst the Billingsgate merchant, again by personal arrangement, may agree to settle his account with his supplier either weekly or monthly, in selling fish to the retailer, the emphasis today is on immediate cash settlement or, at most, weekly settlement. Nevertheless, the relationship between the Billingsgate merchant and the retailer is as personal as between the Billingsgate merchant and his supplier with the result that some retailers who are consistent purchasers from a particular firm will have arrangements for monthly settlement.

In the main, disputes arising from sales in the Market are largely based on complaints of quality and whilst sometimes the services of the Clerk and Superintendent are invoked and those of the Fisheries Counsellor at the respective Embassies in respect of foreign fish, most arguments and disagreements are settled by the parties themselves, usually on the basis of an agreement to share any loss equally.

The total amount of fish passing through the Market for the period January to December 1967 was 79,175 tons.

To elicit information concerning a major redevelopment scheme, in February 1966 a survey was made of retailers' vans and carriers' vehicles parked around the Market. This revealed that between 07:00 and 07:30 hours no fewer than 260 were standing in the streets adjoining the Market waiting for fish to be delivered by the Market Porters. A number of these vehicles were of heavy types delivering to upwards of 20 retailers.

These vehicles distribute over the area of Greater London, within 15 miles radius of the Market in the centre of the city.

MARKET INTELLIGENCE AND SPECIAL SERVICES

Each day an advice sheet is compiled by the London Fish Merchants' Association, and distributed to its members, i.e. the tenant merchants in the Market. This gives details of landings to be made that day at several ports around the coast, and of expected foreign supplies. Armed with this information the Billingsgate merchant is able to judge when a particular variety of fish is likely to glut the Market or, alternatively, to be in short supply. His purchases are adjusted accordingly.

With the majority of sales completed by 09:00 the Clerk and Superintendent of the Market arranges each day that a member of his staff visits leading merchants to obtain details of prices obtaining that morning. Six leading merchants are questioned in respect of each variety of fish and a comprehensive price list compiled giving the range of prices of no less than 110 varieties and sizes of fish from the lowest to the highest price obtained that day. This information is given to Reuters Press Agency and leading London newspapers.

PRESENT TRENDS

Regrettably it has to be admitted that there has been a continual decline both in English and foreign supplies over the past decade or so. This loss of weight, however, should not be interpreted as a loss of business or that the Market is declining, the reduction in throughput being attributable in the main to a change in presentation of fish.

Whilst a number of organizations have sprung up since the last war and now deliver fish direct from the port to the retailer thus by-passing the Market and obviously detracting from the tonnage passing through, the greatest loss of weight is due to the change in presentation of fish. Whilst ten years or so ago fillets were almost unknown in the Market, with the many and heavier increases in transport costs and the cost of manufacturing the container box, be it wood or a substitute material, the trend throughout this period has been towards filleting thus reducing the bulk of the fish, with an obvious reduction in the size of the box required and a consequent reduction in transport costs. Careful study of the daily arrivals reveals that today no less than one-third of the supply of cod, haddock and plaice is presented in filleted form.

A further study of the present day Market would reveal the Billingsgate merchant as being alive to the needs of a changed London population with its influx of Central Europeans, Asians, Africans, etc., and he is scouring the world for the unusual fish that this trade demands.

The Soho restaurants, together with the Indian, Pakistani and Chinese eating houses now springing up all over the London suburbs, require tit-bits of unusual fish, and Billingsgate, in endeavouring to meet these demands, in a recent year imported many kinds of new fish products from all over the world, including prawns, squid, octopus from China, flying fish from Barbados, snails from France, garfish, cuttlefish and many others.

Billingsgate is thus taking on an international nature never before known in her history, yet at the same time is maintaining her daily contacts with the established English and Scottish ports, and proving her ability to absorb supplies from the smaller and less important ports which from time immemorial have relied entirely on Billingsgate to dispose of their catch whenever the local demand for fish is unable to absorb the day's landings.

These many sources of supply providing such diverse varieties of fish are the great strength of Billingsgate. Retailers who admit to obtaining certain supplies direct from the coastal merchant are among the first to agree that their total trade is dependent upon the wide range of produce available daily at Billingsgate. In this way the tendency to by-pass the Market is kept to the minimum.

Whilst the Billingsgate merchant is conscious of this direct competition, he ensures that only top quality fish is available, albeit sometimes at a price considered high.

All too often one hears the cry in the Market that fish is dear. Certainly it costs a lot of money—but is it dear? Whilst the raw material is free, it has to be found, caught, gutted, cleaned, stored, transported and marketed—all of which are expensive operations. To build a trawler heavy capital investment is required but this is not all—the equipping; the maintenance; the operating costs are no insignificant items in this day and age.

The frequent trawler disasters involving, as they invariably do, the loss of many lives serves but to remind one of the real price of fish, immortalized by Sir Walter Scott's words:

"It's no' fish ye're buying; it's men's lives".

Fishing Ports and Port Markets in the Federal Republic of Germany

by H. Göben

Ports de pêche et marches portuaires en République Fédérale Allemande

La première section de la communication donne des informations sur l'importance de l'industrie de la pêche allemande, de la flotte actuelle, les quantités débarquées en 1967 pour les différentes pêcheries, le nombre de ports de pêche et les quantités débarquées par groupes de ports. L'auteur donne ensuite quelques détails relatifs à l'organisation actuelle des ports de pêche et au développement de l'infrastructure. Les récents développements portuaires et l'organisation administrative des ports sont également décrits.

Les principales caractéristiques du système de commercialisation sont examinées et notamment les circuits de distribution essentiels, les systèmes de vente généralement appliqués, l'organisation des criées et les services d'information concernant les marchés. Dans la dernière section de sa communication, l'auteur passe en revue les différents problèmes liés à la situation actuelle et à venir des ports de pêche. Du fait de la stagnation dans les ventes de poisson et de produits de poisson ainsi que de la concurrence étrangère, il convient de s'attendre à l'avenir à des travaux limités pour la construction et l'extension des ports de pêche. Le principal problème que pose le système actuel des ports de pêche est celui de l'adaptation aux modifications de structure de l'industrie de la pêche, en particulier à l'utilisation de navires-usine et à l'expansion de l'industrie du poisson congelé.

Puertos y mercados terminales pesqueros de la Republica Federal de Alemania

La sección primera de este documento describe la magnitud de la industria pesquera alemana, incluyendo datos sobre la flota actual así como las cantidades desembarcadas en 1967 por las distintas pesquerías y por grupos de puertos. El autor detalla a continuación el presente sistema de puertos y el desarrollo de su infraestructura. Describe también los últimos avances en puertos pesqueros y en su organización administrativa.

Se indican las principales características del mercadeo de la pesca, incluyendo los canales de distribución, los sistemas de ventas generalmente empleados, las subastas y los servicios de información sobre la situación de los mercados.

En la parte final de su trabajo, el autor se refiere a varios problemas relacionados con el presente y futuro de los puertos pesqueros. Debido al estancamiento de las ventas y a la competencia exterior, no se debe esperar que en el futuro haya mayor actividad en la construcción y desarrollo de estos puertos. El principal problema actual del sistema portuario de pesca es el de adaptarlo a los cambios estructurales ocurridos últimamente en la industria, particularmente en lo que se refiere a la incorporación de barcos-fábrica y a la expansión del congelado a bordo.

SEA fisheries in the Federal Republic of Germany are divided into four types of operations (Table 1):

(a) large-scale deep-sea fisheries
(b) lugger herring fisheries
(c) cutter deep-sea fisheries
(d) inshore fisheries

TABLE 1. FISHING FLEET OF THE FEDERAL REPUBLIC OF GERMANY IN 1967*

Type of operations	*Number of vessels*	*Tonnage 1,000 gross tons*	*Crew members*
Large-scale deep-sea fisheries	153	133.9	4,755
with deep-freeze facilities	55	—	—
Lugger herring fisheries	58	17.5	1,131
Cutter deep-sea fisheries	1,019	28.2	2,531
Inshore fisheries	1,595	—	1,360†
Total	—	—	9,777

* At the beginning of the year.
† Excluding occasional fishermen.
Source: Annual Report on German Fisheries 1966/67.

Large-scale deep-sea fisheries form the backbone of German fisheries. Fourteen enterprises with 154 vessels are engaged in these operations. Mostly limited liability companies, each has several vessels, and six of them operate more than ten ships each. The catchers are steam or motor vessels of 500 to 2,600 gross tons, developing 1,000 to 2,600 horsepower, with crews of 18 to 65 men. Their loading capacity ranges from 420 m^3 (553 yd^3) of fresh fish (for 4,600 Zentner of iced fresh fish) to 1,010 m^3 (1,329 yd^3) of deep-freeze space (for 700 tons of frozen fish fillet, corresponding to more than 40,000 Zentner of fresh fish). (1 Zentner = 50 kg (110 lb)). The fleet includes 56 modern stern catchers with deep-freeze facilities; most of these have processing equipment. The vessels of the large-scale deep-sea fisheries mainly trawl in distant fishing grounds and land chiefly bulk fish (Norway haddock, cod, salmon, herring), including considerable quantities of frozen raw goods.

They operate from the four big German fishing ports of Bremerhaven, Cuxhaven, Hamburg and Kiel, where the enterprises have their headquarters and their shore installations and where the catches are handled and sold or stored.

Lugger herring fisheries, with their sea-salted herring, produce a speciality with a centuries-old tradition. They are operated by five intertwined limited liability companies which until recently had their seats in specialized ports (Emden, Leer (until mid-1968), Bremen-Vegesack (until 1967) and Glückstadt) where they have extensive shore installations of their own. Motor vessels of 150 to 400 gross tons (in four cases also bigger stern catchers of up to 850 gross tons) with crews of 15 to 22 men are engaged in this type of operation. Using drift or trawl nets, they mainly work in the North Sea, but have recently extended operations to distant fishing grounds, and process their catches into salt herring on board. Salt herring fisheries are a purely seasonal activity; out of season, fresh fish and fresh herring are caught with trawl nets and mostly landed at Bremerhaven and Cuxhaven.

Cutter deep-sea fisheries and inshore fisheries are small-scale operations of saltwater fisheries. As in agriculture and handicrafts, the owners usually take a hand in the operations. The two branches cannot always be separated clearly from each other.

Cutter deep-sea fisheries employ sea-going cutters, mostly more than 16 m long (53 ft), with three to six fishermen and engines of 100 hp or more. Modern technical auxiliary equipment, such as echo sounder, radio direction finder, radiotelephones, etc. are available. The deep-sea cutters catch valuable flat fish, herring, cod and salmon, mainly in the North Sea and the Baltic. Catches are sold partly by auction at Bremerhaven, Cuxhaven, Hamburg and Kiel and partly through marketing co-operatives.

Inshore fisheries employ smaller cutters and open vessels less than 10 m long (33 ft), with or without engines, in coastal waters. Vessels have a crew of two to three men and usually remain at sea not more than 24 h. In addition to flat fish and fish found in brackish water, they mainly catch crabs, which are marketed partly through co-operatives and partly direct to traders and industries.

Table 2 shows the landings of German saltwater fisheries by types of operations.

TABLE 2. FISH LANDINGS* IN THE FEDERAL REPUBLIC OF GERMANY, BY TYPES OF OPERATIONS IN 1967

Type of operations	*Landings*			
	1,000 tons		*million DM*	
Large-scale deep-sea fisheries	384.3		254.3	
deep-frozen fish and herring		140.3		91.4
Lugger herring fisheries	33.3		18.1†	
fresh-fish voyages		16.8		8.6
salt-herring voyages		16.5		9.5†
Cutter deep-sea and inshore fisheries	142.6		61.7	
Total	560.2		334.1	

* Fresh-fish landing weight.

† Estimated proceeds from salt herring.

Source: Economics and Statistics (Wirtschaft und Statistik) 1968, p. 213.

Structure of fishing ports

German fishing ports may be divided into the following groups:

(a) Ports of large-scale deep-sea fisheries
(b) Ports of lugger herring fisheries
(c) Ports of cutter deep-sea and inshore fisheries.

Ports of large-scale deep-sea fisheries. This group, which forms the centre of German fisheries, comprises the four big fishing ports of Bremerhaven, Cuxhaven, Hamburg and Kiel. Large-scale deep-sea fisheries are the determining factor of these ports. But a number of enterprises in the other fishery branches also operate in these ports. Numerous processing and trading firms have settled here. Regular fish auctions take place.

Ports of lugger herring fisheries. In these ports (until now Bremen-Vegesack, Emden, Glückstadt and Leer), the enterprises of lugger herring fisheries have their own wharves and extensive shore installations where their ships are fitted out and salt herring is repacked, made ready for sale and stored. These ports are merely home ports; unlike the ports of large-scale deep-sea fisheries, they have no marketing function.

Ports of cutter deep-sea and inshore fisheries. The coasts of the North Sea and the Baltic have another 43 ports on which more than five cutters of over 10 m (33 ft) are based and in which landings of cutter deep-sea and inshore fisheries are generally marketed through cooperative marketing facilities or private coastal wholesale undertakings and enterprises of the fish industry. These ports are home and marketing ports for cutter fisheries. Nineteen of them are situated along the North Sea coast of Lower Saxony (including Dorum, Fedderwardersiel, Neuharlingersiel, Greetsiel and Norddeich), ten are on the North Sea coast of Schleswig-Holstein (including Büsum, Friedrichskoog, Husum and Tönning), and 14 ports are on the Baltic coast of Schleswig-Holstein (including Burgstaaken, Eckernförde, Heiligenhafen, Maasholm, Neustadt, Niendorf and Travemünde). Apart from these 43 small ports, there are another 125 bases, mostly small traffic ports or simply landing and berthing places, whence individual enterprises of cutter deep-sea fisheries or inshore fisheries, as well as coastal fishermen (who often have other occupations as well) engage in fishing. But these bases are only of local importance. Table 3 shows the breakdown of total catches in 1967 among the various groups of ports.

Development and trends

Saltwater fisheries, handling, trade and processing had been decentralized in many coastal places for centuries. As large-scale deep-sea fisheries developed with the use of steamers and transport speeds increased on land, new outlets could be opened up, expanding the marketing of fish beyond local consumption. Certain centres of gravity emerged for fisheries during this period in Geestemünde/Bremerhaven and Hamburg/Altona which crystallized into fishing ports. About 1890, the State made the first investments in Hamburg and Altona, as well as in Geestemünde and Bremerhaven, to improve facilities for fish auctions, which had been started in Hamburg and Altona by private initiative and in Geestemünde by the municipality between 1886 and 1888. In the following 50 years the State carried out several big investment programmes to enlarge these beginnings and develop the Cuxhaven port of refuge and berthing into big specialized fishing ports. Toward the end of the thirties, there were three centres of gravity at (1) Wesermünde/Bremerhaven, (2) Cuxhaven and (3) Hamburg/Altona. In the first post-war years, the fishing port of Kiel was added, and the other fishing ports were developed further.

TABLE 3. FISH LANDINGS IN THE FEDERAL REPUBLIC OF GERMANY IN 1967, BY GROUPS OF FISHING PORTS*

	Fish landings†			*Fish imports handled*		
	1,000 t	*%*	*Mill. DM*	*%*	*1,000 t*	*Mill. DM*
1. Ports of large-scale deep-sea fisheries						
Bremerhaven	212.8	38.0	142.8	42.7	22.9	17.5
Cuxhaven	162.0	28.9	93.3	27.9	16.7	10.6
Hamburg	48.9	8.7	34.7	10.4	47.4	—
Kiel	48.3	8.6	29.9	9.0	0.1	0.2
Total	472.0	84.2	300.7	90.0	87.1	—
2. Ports of lugger herring fisheries	10.8	1.9	5.2	1.5	—	—
3. Ports of cutter deep-sea and inshore fisheries						
North sea coast—west of Elbe estuary (Lower Saxony and Bremen)	27.3	4.9	8.7	2.6	—	—
North Sea coast—north of Elbe estuary (Schleswig-Holstein)	25.2	4.5	9.2	2.8	—	—
Baltic coast	25.3	4.5	10.3	3.1	—	—
Total	77.8	13.9	28.2	8.5	—	—
Total landings	560.6	100.0	334.1	100.0		

* Partly estimated.

† Fresh-fish landing weight.

Source: Calculated according to Federal Statistical Office, Fachserie B, Reihe 4. Fisheries, and Statistics of the Conference of German Saltwater Fish Market Companies.

The four fishing ports are specialized State ports serving only for the handling of fish. In contrast with traffic ports, which primarily are links between transporters, with industries as a secondary purpose, the fishing ports are points of juncture between primary production, which maintains its shore bases in them, and fish processing and trade. They are central wholesale markets and, because of the perishableness of the goods handled in them, bases for treatment and processing. Besides, they have attracted suppliers and services, as does any other port and industrial base.

In all big fishing ports, the State maintains extensive harbour and market installations:

(a) In Bremerhaven: Harbour basin with locks and 870 m long (2,871 ft) unloading wharf with auction halls behind it (18,000 m² of auction space (4.5 acres)); fitting wharves

(b) In Cuxhaven: Harbour basin with locks and an unloading wharf of more than 1,300 m (4,290 ft) with auction halls behind it (18,600 m² of auction space (4.6 acres)); 570 m long (1,881 ft) fitting wharf

(c) In Hamburg: Harbour basin with 515 m (1,700 ft) unloading wharf with auction halls behind it; 440 m (1,452 ft) fitting wharf with ship-owners' shed

(d) In Kiel: Harbour basin with 140 m (462 ft) unloading wharf with an auction hall behind it; fitting wharves

The infrastructure also includes handling facilities (cranes, etc.), as well as traffic and supply installations. The ports of Bremerhaven and Cuxhaven have their own railway stations and, like the other ports, sufficient roads for loading, and communications. In Bremerhaven, for instance, the port has more than 37 km (23 mi) of rail tracks with 82 switches, more than 200,000 m² (49.4 acres) of surfaced roads, 24 km (15 mi) of principal water mains and 40 km (25 mi) of principal sewerage conduits.

In all fishing ports, work-rooms are allocated to fish processing and trading firms:

(a) In Bremerhaven: 6 industrial buildings, 204 compartments for forwarding arms in two-storey packing halls, a deep-freeze warehouse with a capacity of about 10,000 t.

(b) In Cuxhaven: 10 industrial buildings, 98 compartments in two-storey packing halls, deep-freeze and cold-storage space with a capacity of 12,200 t.

(c) In Hamburg: 3 fairly big packing halls with individual compartments, 1 filleting shed, deep-freeze storage with a capacity of 5,000 t.

(d) In Kiel: Industrial buildings, packing halls and deep-freeze warehouse.

In the other smaller fishing ports, no comparable harbour installations are maintained, apart from landing and berthing facilities for vessels. If work and store rooms are built, this is done by private enterprise, even though the State gives certain support.

Freezing at sea

In the past ten years, thorough structural changes have occurred in German fisheries, which have extensive repercussions on the fishing ports. A trend toward the fishing and factory ship is a particular feature in large-scale deep-sea fisheries. By using this type of vessel, fisheries are trying to reduce the high costs of fishing and marketing. It makes it possible to work in more productive fishing grounds and to improve the ratio of fishing to travelling time. On the other hand, by producing storable fish, fisheries can adapt themselves better to fluctuations in sales and build up a denser marketing network for fresh fish. For vessels freezing the whole cargo there is no longer an absolute need to call at a specialized port, as fresh-fish catchers must do. They can unload their cargo in any traffic port equipped with deep-freeze facilities. However, in general they continue to call at their home fishing ports because they have to be fitted out by their owners' shore installations and their frozen cargoes have to be processed further on shore. For optimum use of their work capacity, these processing plants are appropriately combined with other fish processing plants and therefore have their best base in the fishing ports.

In keeping with this development, installations for handling and storing deep-frozen fish had to be established in the fishing ports, while on the other hand a considerable decline occurred in the utilization of capacity for handling fresh fish. As fisheries turned to factory ships, the fishing ports had to adapt their harbour installations to the bigger ships. Because of their draught (5.20 m (17.2 ft)) and length (90 m (297 ft)), big freezers require much bigger harbour basins than traditional fishing vessels. For this reason extensive investments were necessary in the past few years to adapt the fishing ports to the new requirements. The expansion of Cuxhaven port with its lock and the construction of a turning basin between 1960 and 1967 has to be viewed from this angle. Nearly 100 million DM ($25 million) was invested in this operation.

Current and future trends

Landings in the four big German fishing ports as a whole have strongly dropped in the past ten years. In particular, handling of fresh fish has lessened whereas that of frozen fish has risen. This trend may be expected to continue. As considerable storage facilities were created and supplementary investments were made which increased capacity in the ports over the years—not least for reasons of competition the installations are now too big, that is, utilization of capacity is insufficient, especially that of the installations for handling fresh fish.

After the war, lugger herring fisheries, once a purely seasonal activity, have had to engage in periodic fresh-fish operations for better utilization of capacity. As fresh fish in sizeable quantities can be sold only at the auctions of the big fishing ports, the big herring fishing companies have operated for years from two different bases. This policy has doubtless increased costs. It has been definitely realized only recently that a shift to the ports of large-scale deep-sea fisheries is inevitable, with the result that the specialized ports of lugger herring fisheries are now being abandoned.

For cutter deep-sea and inshore fisheries, too, further concentration in the salt-water fish markets is considered useful because these markets offer better outlets and the marketing problem is gaining importance for this branch of fisheries. But further concentration is meeting with difficulties because of the situation of fishing grounds and social considerations. Closer ties of cutter fisheries with the central saltwater fish markets are therefore necessary by means of organizational measures for marketing.

CONSTRUCTION AND MANAGEMENT OF PORTS

In the big fishing ports of Bremerhaven, Cuxhaven and Hamburg, ownership of harbour installations and harbour construction are separated from harbour management. The harbour installations are directly owned by the coastal Lands (States) and are built under State control. Harbour basins and embankments are maintained directly by the State For this purpose, the Lands have port construction administrations which generally come under the Department of Economics and Transport and which have jurisdiction not only over the fishing ports but also for traffic ports and certain waterways.

In cooperation with the port management company, the port construction administration plans construction and development work and draws up the blueprints for it. The actual work is farmed out to construction companies. Certain kinds of maintenance work, such as continuous dredging, are partly carried out by the administration itself. The funds for maintenance and development are allocated under the ordinary and special budgets of the Lands (States). In a few cases, the port management companies have raised funds on the money market to finance the development of shore installations, and repayment comes out of the companies' revenue.

Port management outlined

Management of the four big fishing ports and their salt-water fish markets is in the hands of port management companies whose capital lies with the coastal Lands and whose operations in their basic decisions are determined by the executive of the coastal Lands; in Kiel, the City of Kiel is an additional partner in the port company. The port management companies are companies under commercial law (Gesellschaften mit beschränkter Haftung—limited liability companies). This form has been chosen because operation is more flexible and more adaptable than a state administration severely hemmed in by budgetary rules. On the other hand, the state management company has stronger financial backing from the owner of the port than a purely private port management company would enjoy. It can guarantee neutrality in handling and marketing, but on the other hand it can also be used as an instrument of the State's fishery policy.

There are naturally close ties between the port construction administration and the port management company. In Cuxhaven, for instance, the director of the state port construction office is also a manager of the port management company; here the port management company relies on assistance from the port construction office in carrying out certain tasks (maintenance of installations).

Under agreements of conveyance or leases, the coastal Lands have handed over harbour basins and embankments to the port management companies for use, administration and operation. In Bremen and Lower Saxony (for the ports of Bremerhaven and Cuxhaven), agreements of conveyance have been concluded whereby the management companies receiving the shore installations are obliged to maintain and renew them. To this end they have to set up a renewal reserve out of their revenue. In addition, they have to pay a state levy based on turnover for the transference of the installations, provided operations show no loss. Any profit has to be paid over to the State.

In Hamburg, a lease has been signed instead of an agreement of conveyance. As a result, the management company pays rent instead of a state levy. In Kiel, the position was similar for a long time, but the management company recently acquired the area used by it from the Federal Government and the City of Kiel.

The many small ports, mostly owned and maintained by the coastal Lands, are usually not run by management companies. The State merely provides the installations, while the users attend to handling.

Work of port management companies

In addition to administration, maintenance, renewal and modernization of installations, the port management companies have to operate the fishing ports.This inciudes:

(a) unloading of fishing vessels and importers and complementary services (cleaning of fish holds, transport, other handling operations)
(b) sale of freshly landed fish at auctions with complementary services (settlement of accounts, market statistics, etc.)
(c) administration and letting of real estate and buildings
(d) general promotion of local fisheries.

The classical handling operation of the port management companies is the unloading of fresh fish from fishing vessels. For this purpose, they have to provide unloading equipment (containers, conveyors, winches, etc.) and unloading crews. The capacity of unloading operations (especially the labour force) is geared to average handling work of a port. Organizational measures are taken to cope with peak demands. Strong seasonal and short-term fluctuations in landings often cause considerable difficulties to the management companies.

Unloading of fresh fish from fishing vessels has undergone little change over the past decades. It consists of the following operations:

(a) unloading from the vessel
(b) transport to the auction hall
(c) sorting and weighing
(d) transport in the hall

There are considerable difficulties in achieving a greater degree of mechanization in the unloading of ships and during sorting in the hall. It is only in the past few years that some progress has been made in this field, especially by installing particular equipment on board ships.

Fees, depending on ships' sizes and types of goods, are charged for unloading. Under special circumstances demurrage or other surcharges are added to the unloading fees. Goods not auctioned by the management company have to pay an additional fee for use of the hall or a handling charge.

In addition to fresh fish, the companies also handle deep-frozen goods, fish in barrels, salted fish, industrial fish and fishmeal. Special equipment (cranes, fork lift trucks, vehicles) is available for this work, which is based either on an unloading fee per ton of goods handled or on hourly wages for workers and fees for the use of equipment On the whole, unloading tariffs do not fully cover costs.

The management companies also arrange auctions to sell the landings of fresh fish. Fish auctions are publicly announced sales staged on week-days in the auction hall under the management of the companies, at which interested parties are invited to bid for the goods on display. For this service, the market companies charge auction fees amounting to 4 to 6% of gross proceeds. These fees cover the costs of this branch of business.

The fishing port managements follow a uniform policy in fixing the auction and unloading charges.

Another task of the fishing port management companies is the letting and leasing of rooms and land to fishery enterprises which have their seats in the ports.

Work rooms are let to coastal wholesale firms. Since the founding of the fishing ports, these rooms have been called packing halls because wholesalers originally used them only to pack the fish bought at auction. Meanwhile, these packing halls have partly become highly modern industrial rooms. The packing halls either directly adjoin the auction halls or they are self-contained buildings near the auction halls.

In the past few years there has been an increasing tendency to provide purely industrial undertakings with modern work and store rooms suited to their purposes, on extremely favourable conditions, at least temporarily, to help them overcome existing difficulties of adaptation. These enterprises are in competition with others not enjoying the same benefits. The rents fixed without regard to costs distort competition in fisheries. To solve this problem, attempts are being made to make rents uniform and harmonize them with other measures in fishery policy.

The fishing port management companies also possess extensive deep-freeze and cold-storage space which they operate partly on their own and partly with the help of private "management companies for deep-freeze warehouses". In the past few years, this sector has undergone special expansion in line with the restructuring of the fishing fleet.

The companies also let work rooms, store rooms, office space and storage sites to ship owners and suppliers.

Apart from these three main tasks, the port management companies, in varying degree in the different ports, carry on activities aimed at promoting local fisheries and strengthening their power of competition. They operate supply services (water, electricity), manufacture ice, implement joint measures for publicity and sales promotion (preparation of information and advertising material, training courses, demonstration kitchens, guided tours for visitors), collect information, and create housing for workers together with other interested groups.

ORGANIZATION OF FISH MARKETING

The raw commodity stage of the fish market in the Federal Republic of Germany is largely concentrated in the fishing ports. In this stage, catchers and importers sell fresh, iced and frozen fish and fishery products to industrial and trading firms mainly for further treatment and processing. After treatment and processing, the products reach consumers essentially through two channels: the specialized fish trade (mainly problem goods) and the general food trade (products posing fewer sales problems). These channels are intertwined: competition has led to some division of labour between them.

The raw commodity stage of the fish market has now to be discussed. Total supply of raw goods consists of landings by the German fleet and of imports. German fisheries at present supply two-thirds of the goods for food purposes, while imports account for the remaining third. Raw material for fishmeal is being supplied almost entirely by the German fleet.

TABLE 4. TOTAL SUPPLY ON THE RAW GOODS MARKET OF THE FEDERAL REPUBLIC OF GERMANY IN 1967

		1,000 tons Fresh landing weight	
Fresh fish:	Iced	250	
	Frozen	128	
	Total		378
Herring:	Iced	164	
	Frozen	58	
	Total		222
Shellfish and crustaceans			18
Total commodities for food			618
Raw material for fish meal			98
Total supply of raw goods			716

Source: Calculated according to landing and foreign trade statistics of the Federal Statistical Office.

Raw goods (see Table 4) are mainly bought by the following groups which sell them on the markets for finished products after treatment and processing:

(a) The **fish industry** takes nearly the whole quantity of fresh and frozen herring, about one-third of frozen fresh fish, about 70,000 t of iced fresh fish

(b) The **coastal wholesale trade** buys the main part of iced fresh fish, a part of frozen fresh fish and a small part of fresh herring for fresh consumption

(c) The **sales companies for deep-freeze foods and exporters of frozen fish** take the main part of frozen fresh fish

(d) **The specialized wholesalers and specialized industries** (partly cooperatives) utilize shellfish and crustaceans

(e) The **fishmeal industry** takes raw materials for fishmeal and waste products from industry and coastal wholesale trade

The fish industry processes herring into marinade, canned goods and smoked products, while certain kinds of fresh fish serve as raw material for smoked fish, salmon in oil and frozen fish. Frozen fish is processed further into preparations (small fish sticks) and fillet packaged ready for consumption. The food trade is the main buyer of the fish industry; only problem goods (for instance, smoked fish) are sold through the specialized fish trade to any great extent.

The coastal wholesale trade uses the major part of iced fresh fish for fillet; only about 20 per cent is sold as round fish with or without head. Fresh herring and certain kinds of frozen fish complete assortments. Two-thirds are sold through the specialized fish trade with the major part passing through an inland wholesale stage. The remaining third passes through the food trade and to large-scale consumers.

Marketing methods

The various sectors of the raw goods market have different sales systems. Two-thirds of landed and imported iced fresh fish and herring are sold by fish auctions.

The main part of frozen fresh fish and herring is sold under delivery contracts. Delivery contracts valid for one season are also concluded for a part of herring landings of large-scale deep-sea fisheries. For crabs intended as food, there are also firm agreements fixing prices for longer terms. Raw materials are delivered to the fishmeal industry under delivery contracts.

There are longer-term delivery contracts for a part of imports, while the other part is disposed of in direct purchases. A number of operators in cutter fisheries market their catches in direct sales to consumers or coastal wholesalers.

In connection with the structural changes in fisheries, a shift among these marketing methods has been noticeable in the past few years. While delivery contracts and free sales are coming to the fore, the share of auction sales has been declining steadily. It has dropped by nearly one-half since 1960. Nevertheless, more than 40 per cent of all goods intended for food is at present still being sold at the classical auctions of the four saltwater fish markets.

Procedure of fish auctions

After unloading the fish and sorting it according to species, size and quality during the night, the fishing port company displays it, by vessel, in its auction containers in the auction halls.

A State veterinarian inspects the condition of the goods before the auction. Under the rules of the food police, goods unfit for consumption are marked and eliminated from the market. Representatives of the saltwater fish marketing company (shipowners' sales company) mark the goods according to quality (S, A, B, C). While this is being done, prospective buyers may examine the goods.

Auctions start in all fishing ports at 07:00 on each week-day. The order of sales is based on the order of arrival of fishing vessels. The auctioneer describes the block to be auctioned and determines the size of the lots a buyer may acquire per round. This increases the number of selling operations and helps in gradually reaching the most favourable price. At the same time, it reduces the buyer's risk and the danger of a few big buyers dominating the market. The auctioneer starts from a lower price limit (set by the saltwater fish marketing company), with increases of ½ pfennig (1 cent) per ½ kg (1.1 lb), until the highest bidder acquires the lot. A clerk keeps a record of proceedings, the cases are marked, and the auction continues. Unsaleable goods are mostly sent to fishmeal factories by order of the seller.

After the auction, buyers take their goods in the auction containers of the market company to their plants. As a result of adjustments in assortments, this causes a considerable movement of raw goods among the various fishing ports. The port management companies in 1966 formed a pool of auction containers (84,000 synthetic Vestolen boxes) for a more rational use of containers to reduce the movement of empty boxes.

From the viewpoint of preservation of quality, the fish auction is a problematical form of sale because the display of goods reduces their quality. On the other hand, it makes for extraordinary speed and mobility in price formation and turnover of goods and permits purchases at sight, which offer certain advantages in view of the heterogeneous nature, great variety of species, kinds and quality and the constantly changing quantities of supplies. For these reasons, it has so far been impossible to replace auctions as the marketing method for fresh fish with something else, but there have been nearly successful attempts to reduce the drawbacks by improved construction and technical facilities and organizational measures. Following the auction the port management company settles accounts between buyers and sellers on the basis of the auction records and with the help of data processing equipment. Buyers are granted nine days for payment. At the same time, certain fees are calculated and collected (marketing charges, association fees, unloading fees). On behalf of shipowners, the port management company also carries out calculations for equalization of proceeds and statistical evaluations.

Collection and diffusion of market information

This is of special importance owing to the functioning of several central markets side by side, strong market fluctuations, and the perishable nature of goods. There is a continuous exchange and diffusion of market information in close cooperation between the market companies and a news and vigilance organization. An information sheet with the most important data on the composition of supplies in the various markets is already available before the auctions start. During the auction, information is exchanged on the development of prices and posted in the auction hall. After the auction another information bulletin is issued on the prices for the various species and kinds of fish on the various markets, on probable landings in the next few days (arranged according to ports), on vessels at sea, and on weather conditions on the fishing grounds and in the interior of the country.

In addition to current information on markets, comprehensive communications machinery is available in the auction halls whereby participants in the market can keep in constant touch with their headquarters and with their buyers in the interior of the country.

PRINCIPAL PROBLEMS OF GERMAN PORTS

New construction and expansion of fishing ports or major development work may not be expected in the Federal Republic of Germany under present conditions—stagnant sales and the pressure of competition from foreign countries and other domestic economic sectors. For years the principal problem has been the adaptation of ports to structural changes in fisheries.

Fishing port policy concentrated for a long time on improved construction and equipment, better organization, greater attention to hygienic considerations, in order to counteract the deterioration of quality of fresh fish bound up with handling and auction and to rationalize handling operations. There were suggestions for the mechanization of traditional unloading procedures and to replace fish auctions with another system. But these endeavours have largely failed because of technical and organizational difficulties. It would seem that this problem is solving itself as a result of the restructuring of the fishing fleet and fish marketing in the direction of frozen fish which is amenable to other more efficient unloading and selling techniques.

The principal problem of German fishing ports today is not so much the unloading and selling techniques as political-organizational factors. The four big fishing ports belong to different coastal Lands (States) which have sole competence for port policy and, together with the Federal Government, also determine fishery policy. For reasons of regional policy, each coastal Land is trying to stave off painful restructuring processes as far as possible from its own base and its own fisheries. It grants subsidies even to strongly shrinking sectors of fisheries in its own port, thus delaying necessary processes of adaptations as a whole. This policy threatens to have fatal consequences for fisheries.

In 1960, large-scale deep-sea fisheries landed and sold 230,000 t of iced fresh fish for the domestic market. In 1967, the quantity had dropped to 110,000 t. Considerable quantities of iced fresh fish were unsold, whereas domestic sales of frozen fresh fish have been rising strongly in recent years. In view of the scrapping programme planned by fisheries, a further decline may be expected in the turnover of iced bulk fresh fish. Assuming a drop to 80,000 t by 1970, average weekly landings may be expected to total only 1,540 t. With an average quantity of 135 t per vessel, 11 to 12 ships of large-scale deep-sea fisheries would land cargoes per week. Since fishery capacity is unevenly distributed among the bases, it may be expected that two ports would be supplied each week by 4–5 vessels and two ports with 1–2 shiploads of iced fresh fish. With such small quantities, neither unloading capacity nor the processing capacity of the fish trade can be utilized in a rational manner. Moreover, it will be impossible to offer a complete assortment to buyers on the saltwater fish markets.

This makes it necessary for fishing ports to achieve specialization and division of labour, with a certain degree of concentration of fresh-fish landings of large-scale deep-sea fisheries and cooperation among the port managements. In this connection, one would have to examine whether neighbouring ports might combine their operations. Failure to face these decisions would cause setbacks, as a result of generally bad utilization of capacity in all ports and enterprises of the fresh-fish sector even harder for fisheries as a whole than may be expected even with sensible concentration, coordination and cooperation.

DISCUSSION

MARKET AND AUCTION SYSTEMS

Hauke (Fed. Rep. of Germany—Chairman) said market and auction systems not only differ from country to country, but also from one fishery port to another, mostly depending on the type and shape of the port's fleet and whether they were deep-sea fishing vessels or luggers.

Bruski (Poland) stated his paper dealt with a system of unloading, handling and sales of fish which was practised in Poland and in other states with a planned economy. After unloading, the fish was examined by a State Inspector, sorted according to quality, and prices fixed and registered. The crew's wages depended directly on the prices fixed and they were not subject to fluctuations of attendance and bids. In Polish ports, the whole shipload was unloaded into one hall to be graded and then directly transferred for processing. Processing had been largely mechanized in Poland using machines and conveyor belts. After processing, the goods were weighed and again examined by a State Inspector, whereafter they were registered and resold. This resale was usually handled by one central trading organization which bought all the goods in the port and channelled sales to individual buyers. This trading organization aimed at the shortest possible delay in the port, the quickest unloading, and the fish reaching the final buyer as soon as possible. Whereas earlier, problems mainly concerned fresh fish, they had changed character, as nowadays vessels mostly landed frozen fish. New methods providing possibilities of handling fish more rapidly, were constantly under development. A mechanized line might be one solution and was under test in Poland. Where, under fixed prices, surplus fish could not be sold, part would have to be used for fish meal. In Poland such a possibility was foreseen in the pricing system, but in countries without a planned economy this problem might be solved only with government assistance.

Winninger (Germany) and **Cormack** (Canada) asked for additional information on the fixed price system in Poland.

Further details

Bruski in reply, said that price calculations were prepared by different enterprises on a cost basis. There were, however, some cases where the prices were even lower than costs and this was naturally very complicated. In such situations they were forced to buy certain species of fish to keep the fish trade going. This could be done without too many complications by the well-organized Polish fishing industry.

He further said that under their planned economy it was possible to calculate an average value for the activities undertaken. Deviations from this average must, however, be taken into account and therefore they were always willing to accept, for instance, larger supplies than planned. It might thus well happen that the ports could not receive all fish landed because of inadequate capacity. Then it was necessary to process the fish elsewhere or use other means of disposal. For instance, this year they had had large catches and enormous landings, so that they met quite a number of problems, not only in unloading facilities but even in storage capacity. Therefore it became necessary to contact foreign countries and agreements were made with them for cold storage. Those countries were chiefly socialist countries, but they also used Belgium, Norway and Sweden.

Ocampo Siguenza (Mexico) was of the opinion that in some cases, especially in countries with a backward economy, it might be convenient for the fishing industry to cooperate with the government to establish a fixed price system, especially when the price mechanism did not function adequately.

Effect on quality?

Ghys (Belgium) said he would like to ask Bruski what influence fixed prices had on the quality of the fish, mentioning that the frozen fish from Polish vessels landed at Ostend was always of very good quality, but he was not certain of the quality of the fresh fish.

Bruski (Poland) stated that in Poland they had had the experience that if the fish landed was linked to the wages of the crew they would have a certain guarantee that the crew really tried to supply the best quality fish. As far as processing fish on shore was concerned, the speaker explained that a veterinary supervision was organized which ensured that the quality was maintained. The prices were fixed on the quality of the finished products so that the manufacturing and processing enterprises were interested in supplying the best quality. Those in charge of the quality control were independent of the fishing as well as the processing enterprises; it was a municipal body. For this reason it was possible to say that there was no influence exerted on the people responsible for the inspection. If the crew were not willing to accept the judgement passed by the inspectors they could appeal to a commission which made the final judgement.

Price mechanism on production

Hildebrandt (Netherlands) said he would like to give some information about the market and auction system as a price mechanism. Campleman had told Conference that, after all, the aim of the auction was selling fish, and the fishermen of course wanted to earn as much as possible. The first question was whether an auction was really needed. Auctions were not needed for frozen or salted fish, as it could be stored and the unit cost calculated. But in the main auctions there was enough competition between the fish buyers. Nevertheless, there were difficulties. As long as there was an expanding market the fisherman got a good price, but when the market became saturated it was impossible to sell all fresh fish for consumption at a reasonable price. Fishermen, therefore, wanted what they called a "bottom" in the market by way of a minimum price for their fish.

Several papers had described minimum prices that resulted from negotiations between fishermen and governments, but was there not a better basis for determining minimum prices, for instance, through economic research? He was convinced that fishermen would derive advantages from economic research into the price mechanism for fish. In his opinion several minimum prices were too high. This was not only a disadvantage for the consumer, but also for the fisherman. He held that minimum prices might be necessary, but it was very important to know what was a justified minimum price. Minimum prices that were too low or too high would result in lower total proceeds. In West Germany minimum prices might not be higher than 80 per cent of the production costs. It would be quite clear that a minimum price was not a function of the production costs. If one could not fish profitably at the minimum price, it was necessary to stop production and try to switch over to a more profitable field.

Lindskog (Sweden) asked the Dutch delegation about the auction system at Scheveningen, in particular how it was that only sole and shellfish were sold by the clock but white fish and plaice verbally.

"Dutch" auction explained

Riem Vis (Netherlands) replied that the quantities and measures of the fish had to be standardized to an adequate extent to make it possible to sell by the clock. That was the reason why at Scheveningen and Ijmuiden only "fine" fish (sole and turbot) and shrimps were sold by the clock and not orally. He then described the Dutch selling system for fish which differed from that in most other countries of the world, and was not only used in fish markets, but also in producers' markets for fruit, vegetables and flowers. The fish were sold verbally (through the auctioneer) or mechanically (by clock), but always by way of the so-called Dutch auction. The auction was started at a price a little higher than the highest one expected and from there down until a buyer gave a sign that he was willing to pay the last-mentioned price. In his view this was the quickest selling system, provided that the auctioneer had good insight into the market situation of the moment. If he started too low he was made aware of that immediately by the fact that, within an officially fixed limit, bidding occurred. In such rare cases, auctioning of the same lot would start over again from a higher level. Furthermore, the owner of the fish had the right to have the auction stopped if the price was dropping below his desired level. But he could not then offer the same lot for auction within 24 hours. Apart from that, the selling of a lot was stopped when the minimum price set for certain species of fish by a semi-governmental organization was reached.

Methods in Britain

Norman (UK) said that generally fish sales in Britain were effected by normal auctions with the single exception of Hull where the Dutch auction was practised. At some small ports where the purely local demand was small it was either sold directly to the wholesaler or to an agent at a neighbouring port for sale by auction. He drew the attention of the Conference to the sale of fish on a co-operative basis. All catches were pooled and handled by the co-operative society acting in the role of wholesaler. Some of the fish was sold by auction locally, some by private contract with inland wholesale merchants, and a small proportion by retail in the society's shop. The fishermen members received a more or less fixed price and an annual bonus derived from profit. These societies also dealt in gear and stores, from the sale of which a profit, again shared, was also obtained.

Ferguson (Barbados) explained that in Barbados there were both wholesale and retail controlled prices for fresh fish. There was a Government Marketing Corporation which purchased fish at about five-sevenths of the wholesale prices, and only fish of the highest quality, since it believed that only such fish could be processed. There was no controlled price for frozen fish which was sold at prices which were sometimes twice as high as the price of fresh fish. The fishermen complained that they were not given a fair deal since the businessmen received the greatest benefits from the sales.

The French system

Lafouge (France) said that the paper by Pouliot, "Les ports de pêche français et leurs marchés" (Session XIII) gave information on the regional and national organizations of fish marketing in France. This system was quite original and made it possible to regulate production with a view to protecting producers against market fluctuations, assuring them a guaranteed price for certain species. In France there were several regional committees and marketing boards who had the power to set production regulations and quality standards. They could also levy taxes on fishery transactions, and administered regional market organization and compensation funds. He said that this system could correct certain fluctuations and established the power to withdraw products from the market and effect direct sales under contract and so forth.

Irish regulations

O Mealláin (Ireland) said that fish was dealt with in Ireland in different ways depending on the kinds of fish involved. Demersal and pelagic fish were generally sold by auction. At some places minimum prices were set by the fishermen themselves. Shellfish was seldom auctioned, as it was usually sold to established buyers who took the whole catch of individual fishermen at negotiated prices. Demersal fish was boxed on board the fishing vessels and reached auction in the original boxes. The whole of the demersal catch on offer was exposed for inspection. Only samples of pelagic fish were shown, and the bids were against sample. Herring was not normally boxed on board. The recent introduction in Ireland of regulations for the handling, transport and storing of demersal fish might eventually lead to an end of displaying all the catch and even of the auction system. The regulations covered not only boxing, permissible temperatures and hygiene generally, but also sorting and grading. This might lead to a complete change in marketing arrangements. Fish intended for reduction to fish meal and oil was for the most part sold at a contract price.

Germany uses auctions

Meiners (Federal Republic of Germany) said that the remarks from Bruski were of great interest to him, but there was a considerable difference between a planned economy and a free market economy. In Germany, besides quality inspection through the State veterinarians, voluntary classification according to quality existed and also a minimum price system. This was not always easy to handle because it was on a voluntary basis. He remarked that auctions certainly had shortcomings and defects, but so far he had not succeeded in finding a better method. He held that the auction was the best way of selling fish if one was able to concentrate supply and demand.

How Spain operates

Pérez Bellod (Spain) described the sale system in operation in Vigo. Uniform fish species were sold by sample and by the clock, and were bought by a very large market, usually by canning factories. Fish of different sizes and kinds, subject to inspection were sold by auction. There were a number of authorized consignment salesmen to whom the fishermen might go to deliver their production in order to obtain the best prices. With regard to frozen fish, the volume landed in Spain in 1967 was 105,000 tons—75,000 in Vigo. This quantity of fish could be sold at lower prices than fresh fish, and the marketing network for frozen fish was very different to that of fresh fish. It was an unperishable product which could be stored and therefore prices were set independently by owners and wholesale distributors. Prices were about 50 per cent lower than for fresh fish. It was hoped that the production of frozen fish would reach 150,000 tons in the coming year.

Four methods in USA

Lyon (USA) pointed out that in the United States four methods of selling fish were known: auction system; contract system; negotiated system, and consignment system.

In the auction system many buyers and sellers came together and, through a system of bidding, arrived at a fair price for the day based upon the supply and demand. In the contract system sellers and buyers reached agreement on price through a negotiated contract prior to catch, whereas in the negotiated system the fishermen, after catching, negotiated with the buyers for the highest price. In the consignment system the fisherman shipped his fish to a broker in a terminal market where it was sold for whatever price could be got and the proceeds returned to the fisherman minus a sales charge. There was a free government service available to all buyers and sellers. Eight offices collected and published daily information on prices, quantities caught, etc., and this helped provide all fishermen and buyers with the same information on prices.

SESSION VIII

Problem of Handling Sea Frozen Fish at the Quayside

by S. C. Exon

Problemes de la manipulation à quai du poisson congélé en mer

La communication traite particulièrement de la manipulation du poisson congélé en mer débarqué à Hull, port qui a reçu en 1967 38,000 tonnes de surgelé sur un total de 66,000 pour l'ensemble du Royaume-Uni.

La communication résume brièvement le développement de la flotte de congélateurs depuis 1961, année du lancement du LORD NELSON, congélateur partiel construit aux chantiers Rickmers Werft, de Bremerhaven. Aujourd'hui, 17 navires congélateurs basés à Hull travaillent dans les eaux septentrionales, où ils surgèlent leurs prises. Six autres sont en construction et prendront la mer d'ici quelques mois.

La communication décrit les méthodes de mise à terre et les divers problèmes qui ont dû être résolus.

En 1965, les armateurs des navires congélateurs ont décidé d'étudier une méthode normalisée de débarquement faisant appel à une équipe spécialisée, d'un effectif ramené à 25 hommes environ. Après des pourparlers avec le syndicat intéressé, l'accord s'est établi pour constituer une telle équipe.

Après l'achat de deux transporteurs du type "bananier" fabriqués par la maison Rownsons, de Londres, des essais ont eu lieu vers la fin de 1966, et le nouveau système de débarquement a démarré en mai 1967.

L'auteur décrit la méthode de mise à terre des blocs de poisson surgelé et l'affectation des divers dockers de l'équipe.

Divers problèmes sont apparus, dont la plupart ont été résolus. La cadence du débarquement ayant été considérablement accélérée, il en résulte un abaissement du coût de cette opération.

Pour éviter les retards à quai, on a constitué une seconde équipe spécialisée, qui vient de se mettre à l'oeuvre.

L'auteur conclut en présentant des propositions touchant une éventuelle organisation future des débarquements orientée vers un accroisement du rendement et de la rentabilité.

Problemas relativos a la manipulación en los muelles pesqueros del pescado congelado a bordo

El estudio presentado se refiere especialmente a la manipulación del pescado congelado en el mar tal como se desembarca en el puerto de Hull, en donde en 1967 se desembarcaron 38.000 toneladas de pescado congelado a bordo de las 66.000 toneladas desembarcadas en todo el Reino Unido.

Se da un breve resumen de la formación de la flota congeladora, iniciada en 1961 con el barco LORD NELSON, congelador, en parte, que se construyó en los astilleros Rickmers, de Bremerhaven, y que hoy dia está constituída por 17 barcos congeladores que zarpan de Hull hacia aguas septentrionales en donde congelan sus capturas. Se están construyendo otros seis barcos que empezarán a trabajar en los próximos meses.

Se describen los métodos de desembarque y los distintos problemas que se plantean.

En 1965 los armadores de los barcos congeladores decidieron investigar un método uniforme de desembarque con reduccion de la mano de obra hasta unos 25 hombres, que formarían un grupo especializado. Se celebraron reuniones con el sindicato correspondiente y se llegó a un acuerdo para formar el grupo.

Se compraron dos correas transportadoras de bananos fabricadas por Rownsons de Londres. Se hicieron pruebas a finales 1966 y el nuevo sistema de desembarque empezó en mayo de 1967.

Se hace una descripción y se indica el método seguida para desembarcar de los barcos los bloques congelados, así como la forma de utilizar la mano de obra.

Surgieron varios problemas y casi todos ellos fueron solucionados. Se mejoró considerablemente la velocidad de desembarque, lo que determinó la disminución del costo del desembarque.

Para evitar retrasos en el puerto acaba de empezar a actuar un segundo grupo de congeladores.

El estudio acaba estableciendo propuestas respecto al modo de desarrollar futuros métodos de desembarque que sean más eficaces y económicos.

THIS paper on the landing of sea frozen fish relates only to British practice, and particularly with emphasis on landings at Hull.

In 1963 the percentage of frozen-at-sea fish was 1.1 per cent of total British caught fish landed at the six major ports, and in 1967 the percentage had increased to 12½ per cent. Hull, which lands more frozen-at-sea fish than any other British port, landed 38,000 tons out of a total of 66,000 tons landed at all ports in Britain for the year ended 31 December 1967. From a modest beginning in 1961 a freezer fleet has been built up in Hull of 17 modern vessels, and within a few months a further six vessels will be operating.

This paper will not give a history of frozen-at-sea fish. Experiments had taken place in the late 1950's, and the advantages of freezing fish had been well demonstrated in service by the Fairtry Stern fishing factory ships, and by continental vessels freezing whole fish into blocks; but the only frozen fish commercially available at that period in Great Britain was either frozen ashore or imported.

In 1960 Associated Fisheries Ltd., ordered their first Stern trawler the *Lord Nelson* from the famous German yard at Bremerhaven, Messrs. Rickmers Werft. This ship was designed to freeze half her catch at sea into blocks weighing about 45 kg (100 lb), and the capacity of her cold store is just over 200 tons. The *Lord Nelson* was very soon followed by the *Junella* built to the order of J. Marr and Son Ltd., who followed up very quickly with orders for additional vessels and who became one of the largest operators of freezer trawlers in Britain. The *Junella* was the first British vessel designed to freeze her entire catch and all the newer vessels were designed similarly; part freezing was out, and all subsequent freezer vessels have been designed to freeze the entire catch. So the present freezing fleet in Hull was built up, all landing whole fish in blocks except the *Coriolanus*, which is a factory trawler, filleting her catch using the well-known Baader machinery. This vessel commenced operations in 1967.

These vessels are away from port for periods of up to 50 or 60 days, and land a catch of between 500 and 600 tons in blocks of fish measuring 106 cm × 56 cm × 11.4 cm (42 in × 22 in × 4.5 in) and about 45 to 50 kg (100 to 110 lb) in weight, stored in refrigerated holds at a temperature of −29°C (−20°F). The vessels are from 67 to 73 m (220 to 240 ft) in length, with a gross tonnage of some 1,700 tons. It is usual for a crew of 25 or 26 men to be carried.

In this introduction I have attempted to give a picture of the build-up of the freezer fleet in Hull, and a similar story applies to Grimsby and North Shields, from where the well-known "Ranger" class operate. One freezer vessel, the *Criscilla*, designed for fishing at Iceland, is based at Fleetwood. The same types of problems are encountered at other British ports as at the Humber ports of Hull and Grimsby.

It is obvious that once the freezer vessel arrives at her home port and unloading commences, the most important factor in the landing is the transfer of the blocks to the cold store in the quickest possible time. We are dealing mostly with cod, a cold water species and a fish difficult to freeze and cold store satisfactorily as compared with warm water fish. Delays on the quayside, particularly with high air temperatures, can be most harmful and a prime cause of the deterioration of quality. Many countries had been rather slow in building up low temperature storage, but over the past few years an intensive building programme at Hull and Grimsby has largely solved that problem and at the present time we have on the Humber cold storage for some 150,000 tons of food. In Hull the cold stores are unfortunately not situated within the dock estate, but most are in the vicinity of the fish dock, and the blocks of fish are moved by motor transport from the quayside to the nearby stores, a journey of up to ten minutes.

For many years the labour force working on the fish dock at Hull have been known as "bobbers", a word which derived from the fact of a man ducking or bobbing down when receiving and taking the weight of a basket of fish as it was swung ashore from the deck of the ship landing. These men are members of the National Union of General and Municipal Workers, and agreements for the landing of fresh and frozen fish are made between that Union and the Hull Fishing Industry Association representing the Hull trawler owners.

EARLY UNLOADING METHODS

The *Lord Nelson* in the summer of 1961, was the first part-freezer trawler to land a catch. Her wet fish cargo was discharged in the traditional manner, that is by loading the fish into baskets, then heaving them on to the quay by shore-based electric winches where they were tipped into metal containers. At midnight she moved to another part of the dock, and with a labour force of about 20, commenced to land her cargo of frozen fish. The *Lord Nelson* had been fitted with a swing tray elevator housed in insulated trunking in the ship's hold. The blocks were loaded on to trays and at the top of the trunking they slid out through a watertight steel door in the bridge front and on to the quay side through chutes. On the quay side, forklift trucks loaded the blocks on to waiting transport. During the first landing there was much delay in loading the elevator, fish was constantly jamming and falling from the trays, mechanical break-downs frequently occurred and it was obvious that a larger labour force would be needed. Eventually some 38 men were employed, normally taking three eight-hour shifts. A number of modifications were made to the elevator, the most effective one being the slowing down of the movement of trays, and as a consequence there was a reduction in the length of stoppages caused by fish jamming the elevator.

In 1962 the *Junella* was completed. Designed to freeze whole fish, her owners adopted a different system of landing. A labour force of 52 was used to land 300 tons. In the ship's hold the blocks were placed into rectangular baskets, which were hoisted singly by an electric shore winch on to a portable table placed on the deck. Two hatches were used, each with its own conveyor. The blocks were then transferred to an electric conveyor which carried them to the market and then they went by forklift trucks to open lorries. Each lorry carried six containers of fish and each container held approximately one ton.

As landings increased the same system of landing was used, and many problems came to light. Long delays occurred on the dockside during loading of the pallets and the lorries; many of the blocks were broken by rough handling, the temperature of the blocks rose considerably, mechanical breakdowns of machinery constantly occurred, and injuries to men employed were caused by falling blocks. All these factors caused dissatisfaction to both employers and employees, and it is to the credit of the labour force that they carried on, and indeed, came forward with many helpful suggestions for improvement.

Each year new freezer vessels arrived in the port, many using differing methods of landing and numbers of men employed. Some vessels used the ship's derricks for landing, others used mobile cranes which hoisted from below and swung on to the quayside. Every effort was made to cut down the labour force, but at that time no incentive or bonus system was in operation, unloading was too slow and costly, and proved harmful to the quality of the fish.

PRESENT UNLOADING METHODS

As landings of sea frozen fish increased in the port, it became imperative for the owners to consider a uniform method of discharge, better conditions for the men, and a different system of payment, incorporating a bonus on landings, as an incentive to speedier unloading. There was urgent need also for a trained or specialist gang of men of economical number to operate the method of discharge.

After a good deal of investigation and examination of various systems of unloading in other ports, it was decided to purchase and adapt a mechanical discharging plant on the endless belt system. The choice of a conveyor rather than a pallet system was made because the former fitted in better with the ship's deck and hold arrangements.

In 1965 freezer trawlers were being unloaded in Grimsby with a conveyor system (manufactured by Rownsons

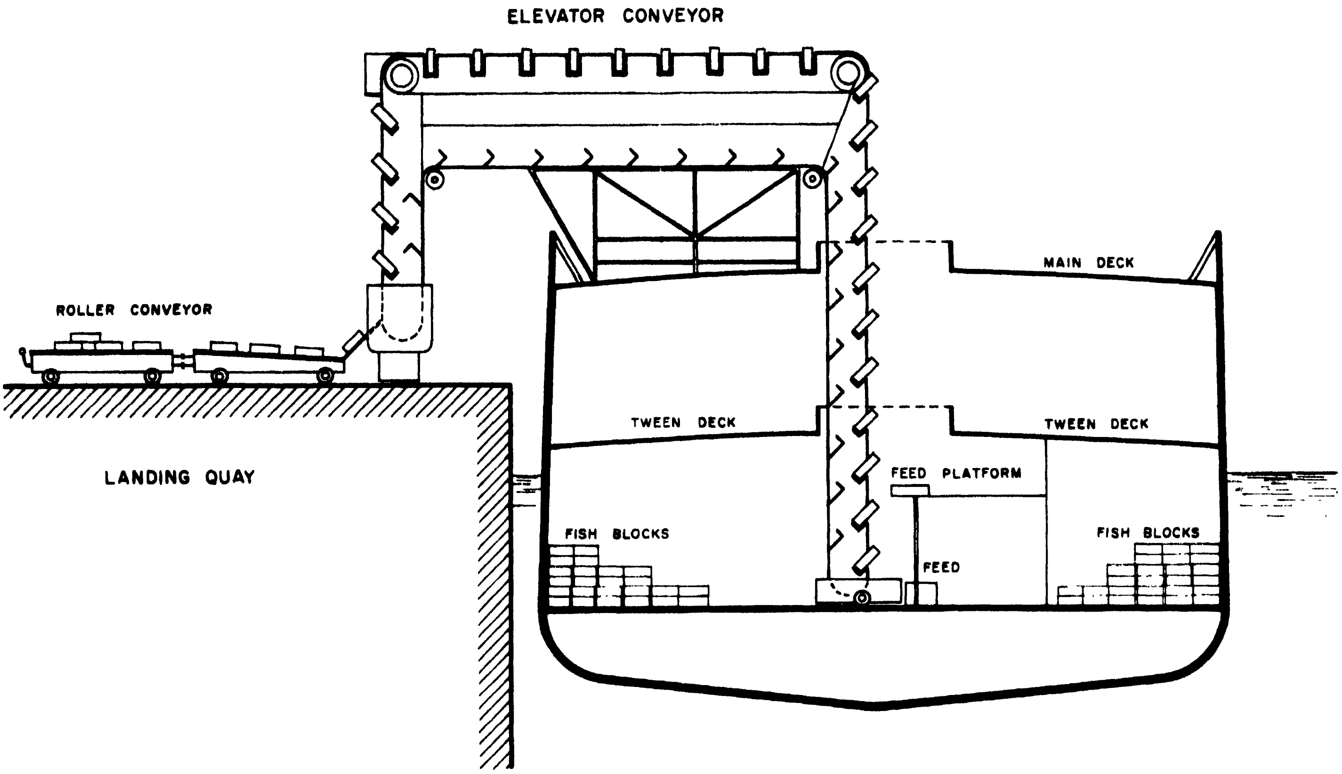

Fig 1. Method of unloading frozen fish blocks at the Port of Hull

Conveyors Ltd of London) formerly used to unload stems of bananas. Hull owners ordered two similar machines. In the shape of an inverted "U" the conveyor is placed over the ship by a mobile crane. Trials were arranged and carried out towards the end of 1966, modifications made, details of labour settled, and the system finally came into operation in May 1967.

When the ship arrives at the quayside a number of pallets have already been stowed under the hatches of the holds. These each contain some 20 blocks of frozen fish, about one ton in weight, and are lifted out by crane. This clears a space in the hold to enable an iron weight of approximately 1½ tons, which anchors the feed bight in position, to sit on the fishroom floor. The space is also adequate to allow eight men, together with their gear such as feeding table, chutes, etc., to commence unloading. Some of the vessels have deep holds, and false floors are built up so that blocks need only be pulled down from a height of about four feet to the feed table; indeed blocks can be fed into the canvas pockets at any level. The conveyor apron comprises a pair of endless parallel chains, connected at intervals by cross bars on which are mounted canvas slings forming pockets into which the blocks are placed. The length of chain adjustment is achieved by a "running off" process on idler rollers situated in the centre bed of the conveyor. The pockets conform to the shape of the article carried so that full blocks, part blocks, or single fish can be handled without difficulty or delay (see fig 1).

In the early days, it was obvious a number of teething troubles would be experienced, and these will be dealt with later.

During final trials, the freezer gang consisted of 24 men, plus the foreman, and a full-time maintenance engineer to attend to breakdowns and be of general assistance. The deployment was as follows:

8 men	First shift in fishroom
8 men	Second shift in fishroom
5 men	Unloading from belt conveyor
1 man	At transfer point from canvas conveyor to belt conveyor
2 men	Forklift drivers

This placing of the labour was found to be satisfactory and has continued to the present time.

In May 1967 an agreement was reached between the Union and the owners, setting out the arrangements, terms and conditions of working freezer trawlers at Hull. Each member of the gang was guaranteed a weekly minimum wage of £19 ($46) with incentive bonus additions dependent on tonnage landed. The freezer gang was to be responsible for rigging the conveyor, preparing the vessel for discharge, landing and sorting the fish, loading on trucks for transportation, unshipping the equipment, etc. Normal working hours to be from 08:00 to 17:00 with one hour break at noon for lunch.

The first Hull freezer vessel to be unloaded under the new agreement was the Boston Group's *Lady Parkes*, with a cargo of 550 tons. The agreement provides that after a minimum target of 150 tons landed in the eight hour shift there would be a bonus for every subsequent five tons landed and 200 tons have been landed on numerous occasions. Overtime is paid when necessary at the usual rates. Preparatory work such as rigging the conveyor, lifting out the palletized fish stowed beneath the hatches, and placing on board the fishroom equipment, is dealt with by a rota of six men who take it in turn to commence two hours before normal shift hours. Stoppages of work caused by a mechanical break-down are covered by an allowance for the time lost, calculated on the basis of the average rate of tonnage landed during the remainder of the shift in which the equipment was operational. The agreement reached is fully comprehensive, and in the year since commencement very few amendments have been made, indeed the new arrangements have been helpful in improving relations between the "bobbers" and the employers, and it should be placed on record that gangs have made many helpful suggestions and done their best to make the scheme a success.

As landings proceeded many problems came to light, causing stoppages. Below is given some of the difficulties met which are gradually being eliminated or reduced.

The movement of the vessel at the quayside must receive continuous attention as a small rise or fall of water in the dock causes great difficulty in the operation of the machine, and requires a constant re-alignment of the shore-based powered belts, conveying the fish to the pallets.

A level trim of the ship must be maintained throughout the whole period of unloading; the slightest list causes blocks to fall resulting in injuries to equipment.

Electrical breakdowns which occurred frequently in the early days, were mainly caused by motors being underpowered. On the belt conveyor, the motor was increased from 1½ to 5 hp. Switches, casings, etc., have all been completely weatherproofed. The small conveyors in the refrigerated holds were extremely poor on starting in the low temperature and here also the motors were increased from ¾ to 3 hp. Special low-temperature oils and greases have assisted in the lubrication of all moving parts.

A number of stoppages were caused by the conveyor belt slipping, and by jamming of the blocks at the changeover from the belt conveyor to the roller conveyor. Guides proved to be the remedy.

At the beginning there was difficulty in loading blocks in the fishroom, but this was overcome by the provision of chutes and conveyors 2.4 m (8 ft) in length giving a more adequate flow of blocks to a feed table.

It has to be accepted that designs of freezer vessels differ. Some freezer vessels having their engines forward, need shaft tunnels running through the centre of the fish hold. These tunnels, approximately 1.2 m (3.6 ft) high and 2.1 m (6.4 ft) in width, cause delay in unloading when the block level is below the height of the tunnel. A remedy has been the provision of powered conveyors to get the blocks over the tunnel from the portside to the feeding point on the starboard side.

Rate of throughput

Before the Rownson equipment was installed the rate of landing was around ten tons per hour with a good deal of extra labour. During the early trials of the machine the output was increased to approximately 20 tons per hour. There is still a considerable difference in landing rates depending on fishroom conditions and stoppages, but 275 tons have been achieved in the eight hours shift, giving an output of 34.4 tons per hour. By October 1967 landings appeared to be settling into a normal routine without stoppages of any consequence. Modifications to chutes, etc., all helped to speed up discharge. The gang were working as a team and increasing their output, and it was in November 1967 that the record of 275 tons already mentioned was achieved.

CONCLUSION

Over the past 12 months each type of freezer trawler based in Hull has been discharged several times by means of the mechanical conveyor and it can be assumed that for some years to come this method will suffice. It is of interest to note that compared with the landings by the previous methods, costs of unloading have been reduced by over 25 per cent. Over 250 tons have been landed in a normal working day, and one can expect very little increase over this figure. The reasons for this assumption are, mainly, the handling capacity of the elevator, the physical limitations of the men working below, and the clearing of blocks on to pallets at the discharge end. Having decided that a reasonable rate of discharge has been reached, the next moves are to cut the costs of the operation by increasing the efficiency of the plant with less fatigue to man and machine.

As far as Hull is concerned, we have just commenced working with a second freezer gang, and some extension to the quayside where the freezer trawlers are landed, is a matter of urgency. At the moment two vessels can be berthed, but careful planning is needed to determine which hatch should be worked first on each ship, in order to permit maintenance and preparation for sea as soon as landing is completed. Provisions, fuel, and fishing gear, when being loaded on to a vessel, must have space apart from that required for forklift trucks and lorries taking away loaded pallets. A third berth is a priority requirement.

A major cost at the moment is the hire of the 15 ton crane, which has to be available, mostly at overtime rate, for lifting the Rownson elevator on board. For the future it has been suggested that the elevator be sited on the freezer quay and not on the ship. This would mean laying down a length of railway track, placing the elevator supporting frames on bogeys and allowing it to be pushed out over the ship instead of being placed on it. Extensive modifications would have to be made to the elevator, and, apart from the saving of cranage costs, several other difficulties would be eliminated, such as constant trimming of the vessels with oil and water, delay in securing the elevator when placed on board, etc. It is estimated that a saving of at least £50 ($120) per landing could be made. The maintenance and servicing of elevators, conveyors, chutes, etc., has considerably improved, and, accordingly has increased the overall efficiency.

Direct loading of blocks on to pallets already placed on lorries would eliminate the use of forklift trucks, but here, as in all the other alterations that may be made, safety has to be the prime consideration. Investigation into other techniques of landings is constantly in hand. Advantages could be brought about by redesigning hatches and fish rooms, with perhaps, built-in unloading systems, and so on to the ideal of direct delivery into cold stores situated on the quayside.

Improved Handling of Wet Fish: Boxing at Sea

by A. G. Hopper

Amelioration de la manutention du poisson frais: mise en bacs a bord

L'auteur décrit la mise au point par la White Fish Authority d'un système de mise en bacs du poisson en mer. Les méthodes actuelles de débarquement du poisson, dont l'auteur signale les défauts, ont des conséquences néfastes sur la qualité du produit.

Au terme de l'étude d'un contenant de taille et de type appropriés, le choix s'est fixé sur un bac d'aluminium d'une contenance de 78,5 l (4,800 in^3), pouvant recevoir 44,5 kg (98 lb) de poisson et 18,2 kg (42 lb) de glace.

Ces bacs ont été soumis à des essais commerciaux, en premier lieu sur le *Summervale* (Aberdeen) en 1965. Ce navire, un chalutier diesel de 108 pieds (32,7 m), fait des sorties de 8 à 10 jours et transporte environ 500 bacs. Cet essai a démontré que la cadence de débarquement par équipe de dockers passait de 5 à 13 tonnes/heure, et révélé la possibilité de réduire la main-d'oeuvre. Le rendement en filets, du fait de l'absence de poissons endommagés, s'est accru en moyenne de 4,5 pour 100 la qualité s'améliorant nettement. De plus, les poissons d'un même bac étant de qualité uniforme, il en résulte la possibilité de perfectionner et le contrôle de la qualité et les méthodes de vente. L'auteur étudie les modifications du système de vente pouvant découler d'une adoption généralisée de la mise en bacs du poisson à bord. Il examine également la nécessité de prévoir un service de collecte et de nettoyage des bacs.

La communication fournit des précisions sur le coût de la mise en bacs en mer. Le prix actuel d'un bac est de £3 7s 6d ($E.-U.9), et la longévité probable de 10 ans. Actuellement les frais de manutention du système mis en oeuvre à Aberdeen sont de 2 shillings (24 cents), montant qui pourrait être abaissé si la méthode était appliquée dans tout le port. D'autres possibilités d'une réduction du coût sont offertes par le perfectionnement des techniques classiques de manutention.

Bien que l'on n'ait pas procédé jusqu'ici à une étude détaillée de la mécanisation du déchargement du poisson en bacs. il est certain que le système offre de grandes possibilités, qui sont examinées dans la communication. Son adoption pourrait également avoir des répercussions considérables sur la pêche elle-même, en encourageant tant les opérations en flottille (avec navire-base) que le sur-refroidissement.

Mejor manipulación del pescado fresco: el envasado en cajas a bordo

En este estudio el autor describe la labor llevada a cabo por la Administración del Pescado Blanco (White Fish Authority) con objeto de establecer un sistema de envasado del pescado en cajas a bordo. El autor describe, en primer lugar, los defectos de los actuales procedimientos del desembarque del pescado y llama la atención sobre las perjudiciales consecuencias de estos procedimientos sobre la calidad.

Se analiza el diseño de un envase de tipo y tamaño adecuados, habiéndose elegido una caja de aluminio de 78,5 litros (4.800 pulgadas cúbicas), que puede contener 98 libras (44.5 kg) de pescado y 42 libras (18.2 kg) de hielo.

Estas cajas se sometieron a ensayos comerciales, inicialmente en la embarcación *Summervale*, en el puerto de Aberdeen, en 1965. Este barco que es un arrastrero de 108 pies (32.7 m), con motor diesel, realiza viajes que duran de ocho a diez días y transporta unas 500 cajas. El resultado de este ensayo mostró que el ritmo de descarga aumentó de 5 toneladas a 13 toneladas por hora y evidenció las posibilidades de reducir la mano de obra necesaria. El rendimiento en filetes, como resultado de la ausencia de pescado fracturado roto y magullado, aumentó en un promedio del 4,5 por ciento, y la calidad mejoró apreciablemente. Como el pescado envasado en cajas es de calidad uniforme, esto abre la posibilidad de mejorar grandemente el control de la calidad y, por lo tanto, su venta. El autor examina los cambios que se producirían en las operaciones del mercado si se difundiera el envasado en cajas a bordo; examina también la necesidad de establecer un servicio de recogida y limpieza de las cajas.

Se analizan detalladamente los costos del envasado en cajas a bordo. El costo actual de cada caja es de 3 libras esterlinas, 7 chelines, 6 peniques (9 dólares) siendo su duración calculada de diez años. Los actuales costos de manipulación del sistema en Aberdeen son de 2 chelines (24 centavos); a escala portuaria este coste podría reducirse. También existen posibilidades de reducción de este coste mediante el mejoramiente de los procedimientos corrientes de manipulación.

Aunque hasta ahora no se han hecho trabajos detallados sobre la mecanización de la descarga del pescado en cajas, el sistema ofrece grandes posibilidades, que se examinan en el estudio. Dicho procedimiento podría también influir considerablemente en las faenas a bordo, favoreciendo tanto las operaciones de la pesca por flotas de barcos como el superenfriado.

THE majority of the vessels in the British wet fish trawling fleet stow the catch on portable shelves, spaced 230 mm (9 in) apart vertically. In 1967, 80 per cent of the wet fish landed by British trawlers was stowed in this way or about 540,000 tons. Discharge of fish from this type of stowage is a very expensive, labour consuming process, which is not easily mechanized. Furthermore much of the care taken by the crew in stowing the catch, is wasted by the damage and mixing caused by the nature of the landing process.

The practice of unloading wet fish differs very little from port to port. The unloading gangs dig out the fish with hooks or shovels, filling baskets which are then swung ashore, and tipped into market containers ready for auction. In addition to the physical damage, the fish are removed from the protecting ice and lie exposed, in the market containers, to relatively high temperatures for several hours until after the auction and processing. The labour costs of unloading fish in this form are high, ranging from £3 ($7.2) to £6 ($14.4) per ton, compared with the highest unloading charges for merchant ships in commercial docks of about £2 ($4.8) per ton.

For many years the Torry Research Station of the Ministry of Technology had stated that fish correctly packed at sea in suitable boxes, would show a significant improvement in quality over the conventional methods of stowage. This improvement has been subsequently measured as being up to three days extension of edible life over shelf stowed fish. Torry had also stated that boxing the catch at sea could provide a sound basis for establishing a quality control scheme, as each box could be marked as to the day of catching and could be expected to contain fish of uniform quality.

In 1961 the Report of the Committee of Inquiry into the Fishing Industry (Fleck Report) recommended that Boxing at Sea be implemented in all sections of the British trawling fleet. The report added the view that retaining the fish in ice in the boxes throughout the unloading and auction processes could greatly improve the quality and at the same time reduce the costs of handling of wet fish at the fishing ports.

As a result of these recommendations, in 1964 the Industrial Development Unit of the White Fish Authority, were given the task of introducing boxing in the near, middle and distant water fleets still stowing the fish on shelves.

DEVELOPMENT PHASE OF PROJECT

Much of the early work was concerned with identifying problems, deciding on the basic outline of the proposed system, and producing a suitable box. In order to do this, full appraisal had to be made of the existing practices and marketing systems of the main ports. For comparison purposes, studies were made of Boxing at Sea methods in Norway, Sweden, France and in our own Scottish inshore fleet, and in trawlers from the port of Granton which had always boxed their fish.

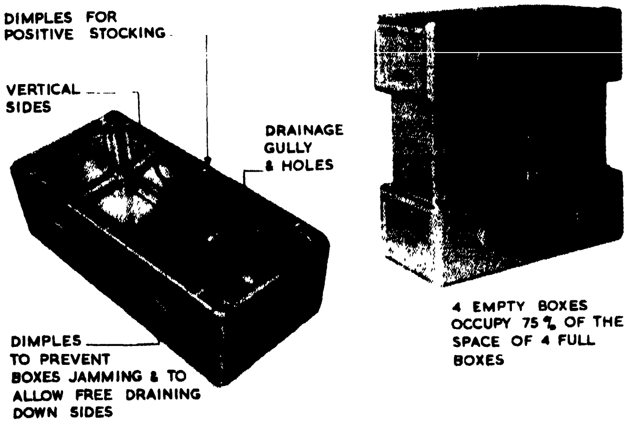
DIMPLES FOR POSITIVE STOCKING
VERTICAL SIDES
DRAINAGE GULLY & HOLES
DIMPLES TO PREVENT BOXES JAMMING & TO ALLOW FREE DRAINING DOWN SIDES
4 EMPTY BOXES OCCUPY 75 % OF THE SPACE OF 4 FULL BOXES

Fig 1. W.F.A. fish boxes

First it was decided that if full advantage was to be obtained from the system, the fish must be gutted, washed and packed in ice in boxes at the time of catching, and should remain in ice in the boxes throughout unloading and the auction, and until processed. Weighing and sorting at the quayside would not be allowed, in spite of the fact that this responsibility would pass to the crews. Torry Research Station prepared a specification outlining the desirable characteristics of boxes for this application but no British design exactly met the requirements.

A series of pilot trials was undertaken on trawlers, using a variety of box designs in different materials. After these trials an assessment of all the technical factors was made and the following design was put into production (fig 1):

Material	Aluminium Alloy
External Dimensions	832 mm (32¾ in) × 391 mm (15⅜ in) × 260 mm (10¼ in)
Capacity	78.5 l (4,800 in^3)
Fish Capacity	44.5 kg (98 lb)
Ice Capacity	18.2 kg (42 lb)

The drainage of slime and melt water was considered important for quality and when the boxes are correctly stacked in the fishroom, there is free drainage of melt water from each box to the ship bilges. The box was also designed to give maximum utilization of space within the fishroom, to be stable against ship rolling when stowed, and to nest when empty. This box was extensively tested on pilot trials from all the major United Kingdom fishing ports, and it was found to fulfil all the technical requirements for boxing at sea.

THE COMMERCIAL PHASE

Commercial trials into boxing at sea were started in 1965 from the ports of Aberdeen and Grimsby. In both ports the technical advantages soon became apparent, but because of the size of the trial, only one vessel in each port, the commercial advantages could not easily be proved. The main difficulty was that the vessel owners would have to finance and organize the change, but the main benefits would be reaped by the fish merchants. Particularly in Grimsby, there was not the confidence that the costs of boxing would be recovered by the increased price for the fish, and, eventually lower unloading costs. In Aberdeen however this confidence was gradually gained over about a year and the commercial trials continued and became what is known as the *Summervale* experiment. The Grimsby trial was terminated after about six months.

The *Summervale* is a middle water diesel trawler of 32.7 m (108 ft) L.B.P. which makes voyages to the North Sea and North West of Scotland lasting eight to ten days. She was first converted in early 1965 to stow her catch in the new boxes, and carries about 500 of them.

The conclusions

After about one year's operation, it was possible to assess the results and make predictions about other gains if the system was to be more widely used.

The unloading rate per gang was increased from five tons per hour to 13 tons per hour without introducing mechanical equipment. At the same time, only nine men out of a gang of 13 were observed to be working. Whilst this situation has not yet been used to lower unloading costs, the potential clearly exists even without mechanization.

Because of the complete absence of broken or crushed fish caused by handling in a conventional manner, the fillet yield increased by an average of 4.5 per cent on the basis of the weight of whole gutted fish.

The quality improvements of boxed fish predicted by Torry Research Station were confirmed, and what is equally important it was found that, because the fish remained iced and undisturbed throughout unloading and auction, it retained its freshness much better than conventionally handled fish. Processors can store it overnight with confidence.

As a box is filled over a short period it contains fish of the same age at the time of unloading, and, consequently, of uniform quality. If the boxes are labelled as originating from the early, middle or later parts of a voyage this would facilitate a quality control scheme or at least enable merchants to buy fish of known quality. Extended to the retail shops this feature could be used as a guarantee that the fish was above a certain minimum quality. Certain British retailers are already insisting on this guarantee.

The work content of stowing the fish in boxes on board appears to be no more arduous than shelfing, and in some cases the crews actually prefer it. They feel that they have a considerable measure of control over the presentation of their fish on the market. Crew trouble from the change has been virtually non-existent.

Fig 2. Discharge of boxes from trawler's fishroom

Boxing has already allowed the owners some flexibility in unloading. For instance, a vessel may arrive at a time too late to catch the market sales under normal circumstances, but because of the high unloading rate possible has been able to land the fish in time for sale. Boxed fish may also be sent overland in certain circumstances from ports near to the fishing grounds (fig 2).

Future implications

To reduce costs will need further extension of the scheme so that labour agreements can be negotiated and mechanization introduced.

Quality benefits soon became reflected in the increased price paid for the fish. At no time since the start has any boxed fish been unsold. In Aberdeen some 4.6 per cent of all landings went unsold in 1965 but the percentage has been less in recent years.

Flexibility in landings could have, in the future, a very marked effect on the timing of unloading and the marketing of fish. The keeping quality of boxed fish could be used to allow unloading to take place at any time of the day or night and the fish could then be stored for a short time until auctioned or processed. To the large fish processing firms in particular this would ensure a more uniform flow of fish to the factory, especially if associated with contract buying.

These facts provided an incentive for expansion to take place and in the last year, since June 1967, seven more vessels of similar size to the *Summervale* commenced boxing at sea in the same manner. It is predicted that steady expansion of boxing will take place in Aberdeen over the next year or so. The success of the *Summervale* experiments, together with a general demand for better quality wet fish, have caused owners in other major fishing ports to reconsider boxing at sea.

SERVICING ARRANGEMENTS

An important aspect of setting up boxing at sea using returnable boxes is to provide a comprehensive service to collect, wash the boxes and supply the vessels with clean boxes. Part of the commercial trials have been concerned with developing a suitable system.

The vessels are supplied with clean boxes from a pool. A firm of sub-contractors is given the responsibility to collect boxes from the merchants, wash and sterilize them, and return them to the pool for subsequent allocation to the vessels.

It has been found it is essential to maintain strict control over the movements of boxes and prevent stockpiling in the merchants' premises or accumulation of dirty boxes. Stockpiling will result in poor utilization of available stocks and costs will increase. Staff are employed specifically for the purpose of locating boxes and getting them back to the pool.

COSTS OF BOXING

The costs of boxing may be broken down into two classifications: capital costs and servicing costs.

The current cost of the box used by the Industrial Development Unit is £3 7s 6d ($9) for quantities of 25,000 and the expected life when used as a boxing at sea container is about 10 years. During that time the box may have to undergo about 10s ($1.25) refurbishing work, but the scrap value at the end of its life may be 8s to 10s ($1 to $1.25) at current prices.

Based on Aberdeen experience so far eight vessels are kept supplied with boxes by maintaining a 40 per cent reserve supply. This can no doubt be reduced as the number of vessels increases provided a strict control system is maintained to keep the boxes circulating.

Regarding the number of boxes to be carried by each vessel, it is preferable not to over-supply the vessel in anticipation of occasional extra large catches. A large number of boxes and hence a lot of capital investment could be poorly utilized. It is the practice on the Aberdeen vessels to stow any excess fish on shelves in the conventional way.

The vessel conversion is simple and consists of removing the existing supporting structure for the shelves, and building vertical linings on the ship's side. A level floor is also necessary. In Aberdeen this costs about £1 ($2.4) per box carried, but in a new vessel there would be appreciable savings in cost by not having to provide the shelf structure. A fishroom fitted with all aluminium shelves has been calculated to cost the same as an equivalent capacity in aluminium boxes.

Servicing costs

As most ports already have servicing organizations for market trunks it will, in general, be a case of adapting these services to the new system. For a full service, consisting of collection from the merchants, washing, storage, transport to the vessel, and stowage aboard, it costs 2s (24 cents) per box in Aberdeen, which includes subcontractors' profit and administrative charges. The White Fish Authority estimate that this service could be provided on a port scale for about 1s 6d (18 cents) per box.

Not included in these costs are the savings resulting from not using the conventional practices. Market containers of course need not be hired or supplied and this represents about 7d to 9d (7 to 9 cents) per occasion in Aberdeen. The labour costs of cleaning and re-positioning the fishroom shelves are also saved.

MECHANIZATION OF UNLOADING

No detailed work has yet been done by the Industrial Development Unit on the mechanization of unloading boxed fish. Nevertheless from the trials so far, some general principles have emerged.

If the present marketing and auction structure is to be retained in the future any mechanization must take into account these requirements. The present unit of sale in all British ports is one box and therefore each box must be laid out singly for inspection. Each box contains a given species and size grade of fish. As the stowage of boxes in the fishroom is at random it is unlikely that pallet loads of 20 boxes or so made up in the fishrooms and put ashore by crane will achieve much by reduction of labour. Each pallet load would have to be broken down and the boxes regrouped on the market according to species and size. The present size of fishroom and fishroom hatch would of course make palletization difficult anyway although this restriction could be eliminated in the future as new vessels are designed.

It would seem that whilst the present auction system remains the boxes should be moved in single units from the fishroom right into the display area. This indicates a conveyor system allowing for sorting of boxes to take place somewhere on the conveyor. Once the boxes had been regrouped on the market according to species they could be palletized to allow removal by forklift truck after auction. This is assuming that merchants would buy the fish in pallet sized units.

In selecting any mechanical handling system the emphasis should be primarily on labour reduction as the handling of boxes alone has already achieved a significant time reduction. As stated previously labour costs are high and gang sizes range from 13 to 17 men with up to five or six gangs employed per ship. In addition to labour costs it is becoming increasingly difficult to recruit and maintain the size of the labour force needed for the conventional handling methods.

FURTHER ADVANTAGES OF BOXING

The Industrial Development Unit of the White Fish Authority have carried out trials in two other areas of which boxing at sea plays an important part.

This summer, transfer at sea operations have been carried out off Iceland between three trawlers of the Hull Distant Water Fleet. The object has been to schedule the vessels in such a way that the fish from the first part of any voyage of a vessel is transferred to another vessel which has nearly completed her voyage. In this way an increased amount of high quality fish is landed. For the transfer the vessels are brought together using pneumatic fenders and boxed fish is then swung across from one to the other. The particular advantage of this method is that the quality is unimpaired in any way as the fish themselves are only handled the once, between catching and processing, and there is no prolonged exposure to high air or sea temperatures.

An interesting aspect of this trial has been the enthusiastic reception of boxed fish by the Hull Fish Trade and it is believed that boxing will be given every encouragement in the future.

A second project carried out by the Industrial Development Unit has been the superchilling of fish on board. Superchilling is well known in Portugal and at least one German vessel is fitted with an installation of the Portuguese type. The technique is to lower the temperature of the fish to slightly below 0°C (32°F) i.e., about −2°C (29°F) at which considerable extensions in edible life can be obtained with only a moderate size of refrigeration plant.

The principle of the Industrial Development Unit experiment was to blow cold air through a stack of boxes, of the type used in the boxing at sea trials until the desired temperature in the fish was achieved. The Portuguese method is to use cooling grids to superchill fish stowed on conventional shelves. The advantage of the Industrial Development Unit method is that a good uniform distribution of cooling is obtained and the boxed fish can be easily unloaded in spite of the contents being frozen together. Although the experiment was a technical success the marketing of superchilled fish represented problems which have yet to be resolved.

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Manutention du Poisson dans les principaux Ports de Pêche français

par A. Gendre

The handling of fish in the principal French fishing ports

This paper discusses in considerable detail the methods of handling at the principal French fishing ports of Boulogne, Concarneau, Lorient and La Rochelle.

The author first analyses the operations involved in physically moving the fish between the hold of the vessel and its departure to inland destinations. He points out that although the cost of this handling represents something between 3 and 10 per cent of the wholesale price, its significance and importance with regard to quality and ease of sale is such that any savings and improvement in this process are most important. The author first examines the nature of the operations, including the unloading of the fish, describing the equipment used for this purpose, its sorting and grading with respect to size. He discusses the needs of the different classes of buyer and he describes the methods by which the fish is moved into the market hall and is displayed for sale. The author then describes in detail the situation at the main French fishing ports.

La manipulación del pescado en los principales puertos pesqueros Franceses

Se explican con toda clase de pormenores los métodos de manipulación en los principales puertos pesqueros franceses de Boulogne, Concarneau, Lorient y La Rochelle.

El autor analiza las operaciones necesarias para acarrear el pescado desde la bodega hasta el punto de partida para los mercados del interior. Menciona que aunque el costo de esta manipulación representa del 3 al 10 por ciento del precio al por mayor, su trascendencia con respecto a la calidad y facilidad de venta es tal que resultan muy importantes las economías y disminuciones de este costo. El autor analiza la naturaleza de las operaciones, inclusive la descarga del pescado y describe el equipo empleado para ello y la clasificación de aquél por tamaños. Explica las necesidades de los diversos compradores y la manera de acarrear el pescado hasta la lonja y su exhibición para la venta.

BIEN que le coût de la manutention du poisson dans les ports de pêche français ne représente que de 3 pourcent à 10 pourcent du prix de vente en criée du poisson débarqué, les marges bénéficiaires des producteurs—quand elles existent—sont actuellement si faibles qu'il n'est pas sans intérêt d'en analyser la composition pour examiner si certaines économies ne peuvent pas être recherchées en particulier dans les ports où les prix de criée sont les plus bas. D'autre part les procédés de débarquement, de tri et d'acheminement du poisson vers les ateliers de mareyage ont une sérieuse influence sur la qualité du poisson vendu frais à la consommation, qualité que les producteurs français tiennent particulièrement à maintenir et à améliorer, de sorte que la comparaison entre les procédés employés dans les différents ports pourra conduire à des perfectionnements sans augmenter nécessairement les frais de manutention. Avant d'examiner en détail pour chacun des principaux ports de pêche français l'organisation particulière de la manutention qui dépend souvent de leurs installations de superstructure, il convient de décrire la suite des opérations subies par le poisson depuis sa capture jusqu'au moment où il quitte le port de débarquement par le rail ou par la route, en nous bornant à la pêche fraiche au chalut, qui fournit de loin la plus grosse partie des tonnages.

Le débarquement

L'équipage du chalutier entrepose la plupart de ses prises (de 10 à 150 tonnes suivant les unités et les saisons) en vrac dans les cales à poisson du navire. Les captures y sont généralement rangées en couches horizontales de 30 à 40 centimètres d'épaisseur, séparées par des planchers en bois évitant de détériorer le poisson en l'entassant sur des hauteurs excessives. Pour les prises données par les derniers traits de chalut, d'une qualité supérieure, le poisson est parfois trié à bord et réparti, dans des caisses d'une quarantaine de kilogramme, dites "caisses d'origine". Cette partie de la pêche ne sera plus, en principe, manipulée, avant l'atelier du mareyeur ou même au-delà, ce qui est une garantie supplémentaire de qualité.

Une fois rentré au port, après une ou deux semaines de navigation, le chalutier est amarré au quai de déchargement et il est alors procédé, sous l'autorité et le contrôle de l'armateur, au débarquement de la cargaison. Dans le cas des unités importantes, ce débarquement est effectué souvent par des ouvriers dockers auxquels s'appliquent, comme dans les ports de commerce, les dispositions des articles 84 à 108 du Code des Ports Maritimes (Loi du 6 septembre 1947).

Les moyens de déchargement et partant les cadences diffèrent largement d'un port à l'autre. Le travail est toujours effectué la nuit; il commence suivant les unités entre 23 h et 4 h, de manière à ce qu'il soit achevé avant la vente à criée qui commence à 7 ou 8 h.

Les engins utilisés pour faire passer le poisson de la cale sur le quai sont soit des grues spécialement adaptées pour la pêche, soit de simples treuils avec renvoi du câble dans le gréement du navire, soit des poutres roulantes ou coulissantes, soit enfin des sauterelles pour les "caisses d'origine". L'utilisation même de ces nombreux types d'appareils montre que l'engin idéal n'est pas encore trouvé; ils ont tous pour but de hisser depuis la cale un récipient en osier ou en plastique, dans lequel ont été déposés une cinquantaine de kilogramme de poisson et de glace. Ces récipients sont soit vidés directement sur les tables de tri installées sur le quai, soit déversés sur le pont du chalutier dans une benne métallique plus importante

(200 kg (440 lb) à Boulogne) qui est elle-même hissés sur le quai par une grue.

Les rendements sont, en général, assez /aibles car le travail est pénible particulièrement pour les ouvriers opérant en cale, qui pataugent dans la glace et doivent hon seulement charger les paniers mais aussi démonter les planers qui découpent horizontalement les cales.

Les "caisses d'origine" se manutentionnent bien entendu beaucoup plus aisément en utilisant des "sauterelles".

Le triage

Dans le cas du poisson en vrac, nous le retrouvons sur la table de tri oú des ouvriers ou ouvrières spécialisés, dockers ou non suivant les ports, distribuent les poissons un par un dans des caisses en bois, en métal ou en matière plastique, appelées "coffres", d'une contenance de 40 kg à 50 kg (88 lb à 110 lb) et utilisés chacun pour une espèce et une taille. L'adoption des coffres en plastique parait devoir être généralisée pour le plus grand bien de l'hygiène.

Ce travail long, minutieux et pénible, exige une main-d'oeuvre experte car certaines espèces se subdivisent en cinq à dix catégories de taille; comme toutes les autres manutentions, il est générateur de chocs ou blessures pour le poisson qui paraissent difficiles à éviter. Le pesage des coffres est de moins en moins effectué, ce qui simplifie les opérations préalables à la vente sans entraîner pour autant de contestations sérieuses.

Entre 7 h et 8 h, les apports de la nuit sont prêts pour la vente et celle-ci peut commencer. Elle s'effectue soit a proximité immédiate des lots, soit en salle, les acheteurs ayant inspecté les lots au préalable. Les enchères se déroulent à la voix, en général, aux enchères montantes. Il est hors de notre propos d'enterer dans le détail de la vente ni des modes de réglement entre vendeurs et acheteurs.

Après la vente

Nous suivrons maintenant le trajet du poisson dont les différents coffres, toujours exposés sur le quai, possèdent à l'issue de la vente un nouveau propriétaire: mareyeur, conserveur, congélateur, saleur, saurisseur.

Dans le cas du conserveur, congélateur, saleur ou saurisseur, le poisson sera en général chargé sur camion par l'intéressé lui-même et acheminé jusqu'à son usine qui, la plupart du temps, n'est pas installée à proximité immédiate du quai.

Dans le cas du mareyeur, de loin le plus important, la marchandise est transportée dans les ateliers de conditionnement qui sont in tallés suivant les ports soit à proximité immédiate des halles d'exposition, soit à quelque distance, en utilisant des moyens très divers allant de la charrette à bras au camion ou au tracteur électrique, ce transport étant effectué soit par le mareyeur lui-même, soit par un service spécialisé, moyennant redevance.

Une fois que ses acquisitions sont reçues dans son atelier, le mareyeur effectue sur elles des opérations très diverses suivant la destination finale attribuée à la

Fig 1. Vue aérienne du port de pêche de Boulogne

marchandise. Il pourra se contenter d'un triage soigneux et d'une mise en caisse par assez grosses quantités dans la glace et sous papier sulfurisé, s'il compte réexpédier la merchandise aux halles d'une grande ville où elle sera vendue à la commission. S'il doit livrer à un grossiste ou même à un détaillant, il deviendra indispensable d'effectuer de petits lots pouvant contenir plusieurs espèces en quantités bien déterminées et même pour certains poissons d'effectuer une préparation telle qu'étêtage, vidage ou découpage des ailes.

Enfin, pour les lots destinées à la congélation, il sera souvent procédé au prélèvement des filets et à leur rangement en caissettes de faible importance unitaire.

La dernière opération de manutention effectuée dans le port de débarquement est l'expédition du poisson traité par les mareyeurs vers l'intérieur des terres. Elle ne présente aucune originalité et réclame seulement dans la zone industrielle du port une gare routière et une gare ferroviaire de marée où les camions et les wagons seront chargés.

Nous examinerons maintenant les conditions particulières de manutention du poisson frais entre la cale du chalutier et les ateliers de marée, dans les ports français de Boulogne, Concarneau, Lorient et La Rochelle dont le tonnage de poisson frais débarqué en 1967 a représenté plus des 2/3 de la production française. Les renseignements donnés ci-après ont été recueillis grâce à la très large participation des Chambres de Commerce de Boulogne-sur-Mer, Quimper et La Rochelle ainsi que de la Société du Port de Pêche de Lorient.

PORT DE BOULOGNE-SUR-MER

Données générales et sommaires sur la pêche et les navires

Tonnage pêché en 1967: 134.735F, dont 90 pourcent par les chalutiers de pêche hauturière et 10 pourcent par les chalutiers artisanaux pratiquant la pêche côtière.

Prix de vente en halle de ce tonnage: 140.767.307F ($28.153.461).

Prix moyen au kilo: 1.04F (21 cents) en 1967.

Lieux de pêche. Manche (bancs du Sandettie et du Vergoyer); Mer du Nord (côtes de Norvège, Ecosse, Irlande, Dogger Bank, les Shetland et Feroë); Bancs de l'Atlantique et côtes Ouest de l'Angleterre.

Flotte de pêche. Cinquante-quatre chalutiers en acier de 32 à 63 m (106 à 210 ft) de long, de construction récente (huit ans de moyenne d'âge) immatriculés à Boulogne-sur-Mer. Puissance des moteurs 450 à 1.870 CV. Equipement radio et électronique monerne. Vitesse maxima: 15 noeuds. En outre 20 chalutiers immatriculés dans les ports voisins sont exploités par des armateurs boulonnais et vendent le produit de leur pêche à Boulogne-sur-Mer. Enfin, une quinzaine de chalutiers de Gravelines et Grand-Fort-Philippe viennent vendre de plus en plus leur pêche à Boulogne-sur-Mer.

Méthode de chalutage. La majorité des chalutiers boulonnais sont à pêche par le côté. Dix chalutiers pêchant par l'arrière.

Pêche artisanale. Cent dix bateaux en bois et cinqu en acier de 50 à 480 CV, dont 54 de moins de 10 ans.

Poisson pêché. Quarante catégories, dont, dans l'ordre d'importance des captures: lieus noirs 33.000 t, merlans 22.000 t, maquereaux 15.000 t, harengs 13,500 t, soit 84.000 t, environ pour ces quatre espèces.

Le Port de Boulogne

La pêche dispose actuellement au Port de Boulogne de trois bassins:

(a) Un bassin à flot de sept hectares (17 acres), éclusé par un sas de 100 × 21 m (333 × 70 ft), dont le seuil est à la cote (+0,14), présentant cependant certains écarts de niveaux, selon l'importance des marées; il en résulte des inconvénients pour l'utilisation du matériel de déchargement qui ne peut toujours être le même suivant qu'il s'agit de périodes de vives-eaux ou de basses-eaux. (Longueurs de quais utilisables pour la pêche: 521 m (1,737 ft).

(b) Un bassin de marée de huit hectares (20 acres) au droit du lit de la rivière Liane; il présente l'inconvénient d'un marnage très important (9 m (30 ft) (Longeueur de quais utilisables pour la pêche 475 m (1,583 ft). La stabilité du plan d'eau est un élément important de productivité et sera recherchée dans la création du nouveau bassin de pêche.

(c) Le bassin Loubet (Bassin de marée) dont le quai Jean Voisin et le môle Sud (soit 393 m (1,310 ft) de quais) sont actuellement affectés à la pêche industrielle. Il sera transformé en bassin à flot par construction d'une écluse de 125 × 25 m (417 × 83 ft) avec seuil à la cote (−5,50 (18 ft), agrandi et entouré de halles de déchargement du même type que celles du bassin à flot; les travaux seront entrepris avant la fin de 1968.

Les halles de déchargement

Les halles actuelles d'une superficie de 14.220 m² (3.5 acres) sont établies sur le pourtour du bassin à flot. Les côtés Est et Sud ainsi qu'une partie côté Ouest sont entièrement couverts. Les halles sont entièrement ouvertes sur le côté bassin, et cloisonnées avec volets roulants sur la face opposée donnant sur les aires de circulation ou de stationnement. Leur niveau en surélévation par rapport à ces derniers permet des transbordements aisés sur camion.

L'éclairage réalisé par des tubes à cathode froide de 2,40 m (8 ft) de longuer, donne au sol un éclairage de

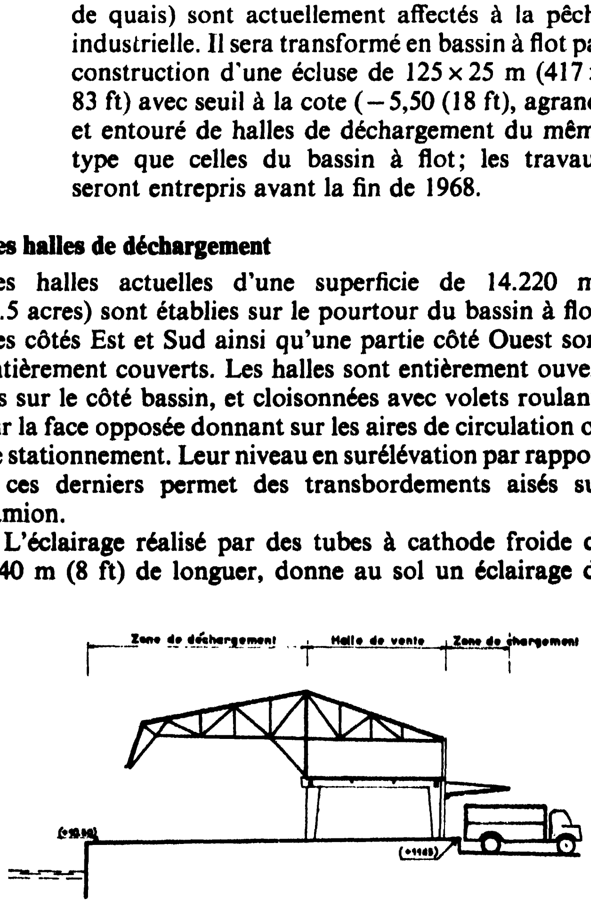

Fig 2. Port de Boulogne sur Mer. Halle au poisson

Fig 3. Lavage du poisson dans les bennes

70 lux satisfaisant; le sol est parfaitement plan et antidérapant; une pente de 2.50 pourcent permet aux eaux de lavage et de fonte de glace de s'écouler dans les caniveaux parallèles au quai ou dans le bassin.

Un dépôt de 1.000 m² (0.2 acres) permet le stockage des coffres destinés à la manutention du poisson et est complété par un plancher supérieur couvrant la moitié de la largeur des halles et courant sur toute leur longuer.

Le bassin de marée dont seul le quai Est est affecté à la pêche sur 475 m (1,583 ft) ne comporte pas de halles couvertes; les aires de manutention sont très vastes et parfaitement planes; elles sont bien séparées du trafic routier.

Les travaux de construction d'une halle le long du quai Jean Voisin de bassin Loubet débuteront en été 1968.

Engins de manutention ou de stockage

Les appareils. (a) 28 grues haulotte automotrices (électriques sur secteur), force 600 kg (1,333 lb); (b) 28 grues sur rail de 0 T 6 à 2 T; (c) 30 treuils; (d) 7 sauterelles ou monte-charges inclinés servant au débarquement des "caisses d'origine"; (e) 16 pompes.

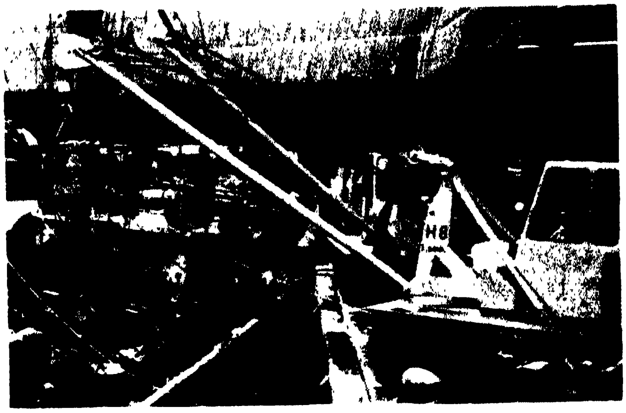

Fig 4. Débarquement du poisson

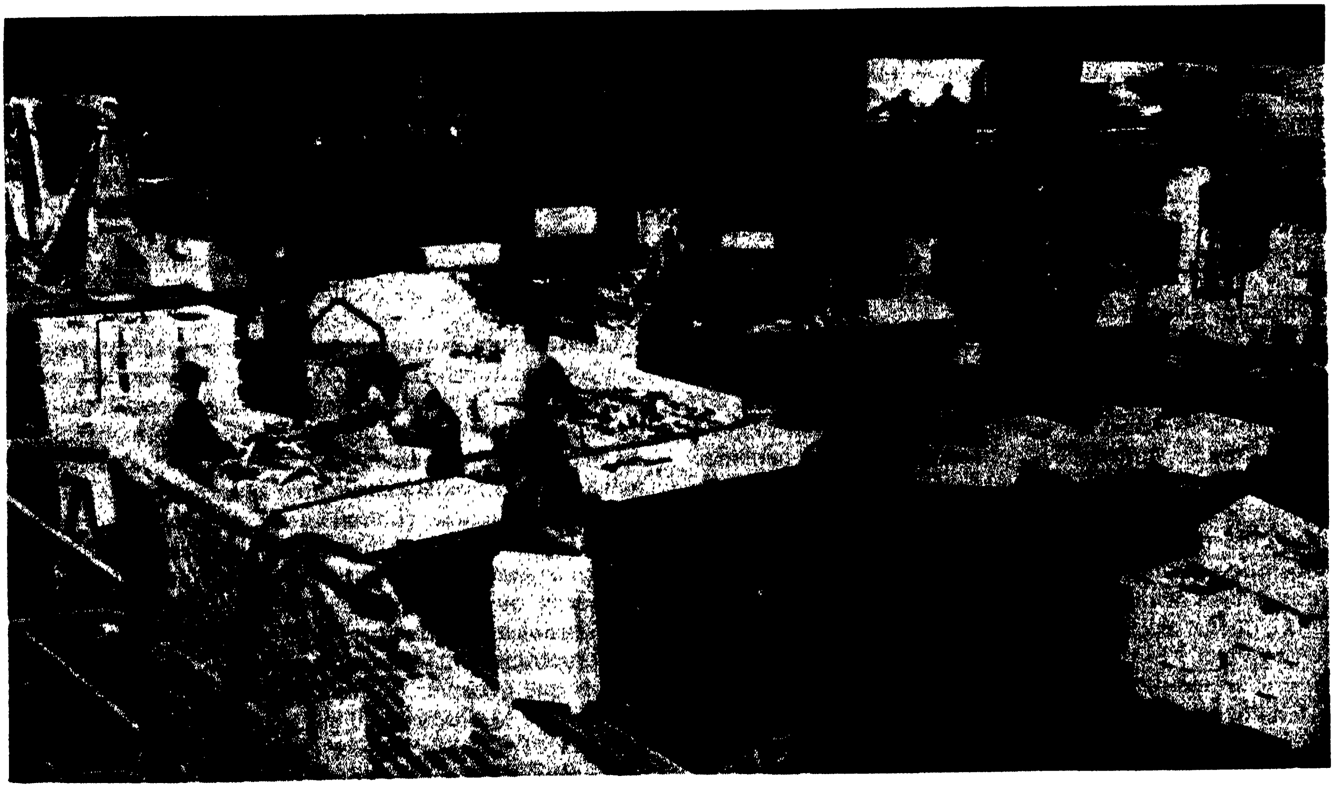

Fig 5. Triage du poisson

Les containers utilisés pour la manutention du poisson sont de quatre sortes: (a) Les caisses en bois dites "d'origine" préparées en mer par les équipages (contenance 25 kg (56 lb); (b) Les pottes ou paniers d'osier servant au transfert du poisson en vrac depuis les cales jusqu'aux bennes métalliques; l'emploi de paniers en plastique dits "tam-tam", du type Bremerhaven, se généralise de plus en plus; (c) Les bennes métalliques qui alimentent les tables de tri (141); (d) Les coffres servant à la manutention, du quai aux magasins des utilisateurs; ces coffres, jadis tous en bois ont été remplacés par des unités nouvelles en matière plastique d'une contenance de 40 kg (88 lb). Il en existe actuellement 45.000 environ.

Il y a lieu de noter enfin les tables de tri et les balances de pesée.

Machine à laver les coffres

La Chambre de Commerce de Boulogne-sur-Mer a mis en service depuis le mois de juillet 1966, une machine à laver les coffres permettant une cadence horaire de 1.200 bacs. Le transporteur a été particulièrement étudié pour n'exiger aucun entretien et il a été allongé pour permettre le transfert des coffres à l'étage du bâtiment.

Le principe de lavage réside dans la traversée d'un tunnel comportant trois compartiments: (a) Un prétrempage à 45° qui comporte une réserve de 3 m^3 (4 yd^3) d'eau douce filtrée en permanence et additionnée d'un produit tensio-actif; (b) Un circuit hydraulique identique oû l'eau additionnée d'un produit détersif de lavage est portée à 65°; (c) Un rinçage abondant à l'eau de mer.

Embauche. Celle-ci est réalisée sous le contrôle du B.C.M.O. tous les jours:

> —de 16 h 45 à 17 h pour les opérations de nuit.
> L'embauche la plus importante est réalisée à 16 h 4.
> Pendant la saison du hareng, quatre postes sont aménagés:
> 0 h–6 h–10 h et 14 h

L'embauche est en fait réalisée à la suite de la demande de l'armement, demande formulée selon les règles fixées par la Directiondu Port. Sur cette demande figure entre autres le nombre des dockers qui semble suffisant pour le déchargement de tel ou tel navire. Ce document est remis à un chef d'équipe proposé par l'armateur, agrée par la Direction du Port.

Ce chef d'équipe procède à l'embauche des dockers qui ont, en général, l'habitude de travailler avec lui; il prend possession des cartes de pointage de ses coéquipiers, les remet au contrôleur d'embauche, préposé du B.C.M.O., qui vérifie la concordance entre la demande présentée et les indications du tableau de service.

Sur la liste nominative des ouvriers dockers-poissonniers, le chef d'équipe répartit alors les tâches; cette opération permet l'affectation de tous les ouvriers à des postes bien définis.

Le docker-poissonnier qui a quitté son travail le matin entre 6 h et 9 h, suivant l'importance des arrivages et qui a pris un temps de sommeil de 8 h à 15 h, ou de 10 h à 16 h environ, est obligé de venir à l'embauche au port à 16 h 45. Puis il remonte chez lui pour dormir une deuxième fois, avant de reprendre le chemin du port entre 23 h et 0 h. Cette pratique, ajoutée à la dureté du travail proprement dit du déglaçage, du tri, de la manutention, fait que le métier de Docker-Poissonnier à Boulogne est accompli dans des conditions sévères.

Il importe pourtant de souligner que l'embauchage pourrait se faire uniquement de nuit. L'embauchage à 16 h 45 n'est pas du tout requis par l'organisation du port ni par les armateurs; il a été demandé par le syndicat progessionnel des dockers lui-même. Si l'on commençait le déchargement du poisson à 20 h, l'embauche pourrait s'effectuer vers 19 h et la vente du poisson pourrait débute plus tôt dans la matinée, 5 ou 6 h du matin.

Critiques et suggestions

L'aménagement des conditions et heures d'embauche pourrait être recherché et une autre répartition des heures, si elle pouvait être obtenue, serait aussi souhaitable. L'irrégularité des arrivages conditionne et rend ardue la modification de la situation actuelle; régulariser les apports et les arrivées de chalutiers, en fonction de la relative concentration de la consommation du poisson le vendredi, pose un problème très vaste d'organisation du marché, de la distribution et surtout d'habitudes profondément ancrées; le problème dépasse ainsi de beaucoup le Port de Boulogne lui-même. Il faut souligner toutefois la tentative des armateurs de régulariser le trafic par une connaissance préalable des apports, tentative qui a donné des résultats le mardi, ce dont les dockers sont conscients; mais pour que le poisson soit débarqué le jeudi, il faudrait qu'il puisse être expédié dans toutes les directions et parvenir le lendemain matin, ce qui est impossible dans la moitié Sud de la France.

En ce qui concerne le vol, il y en a toujours eu sur le port. La pratique de la "gainée", avantage en nature consenti aux dockers a été remplacée avec leur accord par une prime en espèce, mais le vol n'en a pas été totalement supprimé pour autant. Toutefois, grâce aux efforts de la Police et à des effectifs supplémentaires, on a pu constater ces dernières années une diminution importante des vols de poisson. En ce qui concerne la surveillance du port, le problème le plus difficile à résoudre est dû à l'impossibilité pratique de clôturer le port. L'aménagement du nouveau bassin Loubet spécialement destiné à la pêche rendra plus aisée encore à l'avenir la répression du vol, en réorganisant la surveillance autour d'un bassin ou les transactions seront davantage localisées.

L'infrastructure portuaire. L'agrandissement du bassin Loubet et sa transformation en bassin à flot supprimeront, sinon pour la pêche artisanale qui restera au port de marée, du moins pour les chalutiers industriels, l'inconvénient du marnage et la cote du seuil de l'écluse permettra les mouvements des chalutiers actuels à toute heure de marée. Le port de marée continuera néanmoins à présenter l'avantage d'être accessible à toute heure sans éclusage, tant pour les chalutiers que pour les bateaux artisanaux.

Pour ce qui est du bassin à flot, où les dénivellations peu sensibles présentent néanmoins un certain inconvénient pratiquement inéluctable, son sas éclusé n'en permet l'accès que quelques heures par jour, lors des étales de haute mer; l'utilisation du sas nécessite un remorquage coûteux; il est difficile aux chalutiers de prévoir avec toute précision l'heure de leur arrivée au port. Ces contraintes se retrouvent à la sortie comme à l'entrée. Il en résulte inévitablement des attentes et des temps morts qui nuisent à l'utilisation régulièrement répartie du matériel de déchargement ou au plein emploi de l'équipement du bassin, donc à la productivité. Mais il y a là un état de fait inhérent à tout bassin éclusé. Le nouveau bassin à flot permettra d'écluser à toute heure.

Malgré la recherche des meilleures conditions dans la reconstruction du port et la rationalisation de son équipement pour offrir le rendement maximum, on se heurte encore à la trop grande dispersion des installations età leur chevauchement.

Le problème dominant au port de Boulogne pour la mise à terre des apports des chalutiers, et compte tenu du manque d'étalement des arrivages, a été jusqu'à présent un problème d'espace. Il suffisait de voir les chalutiers en épi, avec les difficultés et les dangers d'avarie ou autres que comportait cette solution pour en mesurer l'étendue. La pêche étouffait par manque de place.

Si à ce jour les difficultés ne sont pas encore totalement disparues, il n'en demoure pas moins que la construction de la Darse Sarraz-Bournet a permis de libérer pour la pêche, le quai Jean Voisin du bassin Loubet soit une longeur de près de 400 m (1,333 ft) supplémentaires.

Lorsque ce bassin sera libéré en totalité pour la pêche, agrandi vers l'Ouest et transformé en bassin à flot par la construction d'une écluse à sas, l'accostage parallèle des bateaux, la multiplication des postes à quai et des halles couvertes, le regroupement d'installations trop dispersées au coeur même de la zone industrielle du port, apporteront une amélioration très sensible dans les conditions de déchargement du poisson.

Les halles. Les halles couvertes du bassin à flot offrent pour les opérations de débarquement les conditions de travail satisfaisantes difficilement perfectibles malgré les courants d'air et le froid des hivers, compte tenu de l'obligation de travailler de nuit, d'ouvrir entièrement les halles côté bassin et largement côté opposé. La fraîcheur est une nécessité car le triage nécessaire des espèces de poisson occupe un temps prècieux, au point que la rèfrigération des halles en saisons tempérées ou chaudes serait une amélioration souhaitable.

Les halles en cours d'étude pour le bassin Loubet seront sensiblement identiques à celles qui existent au bassin à flot.

L'aménagement de canalisations d'évacuation de la glace à l'intérieur des sols, au droit des postes de tri, serait désirable.

L'installation du maximum de postes de tri, fixes ou semi-fixes, éviterait les déménagements quotidiens de ces installations; elle existe dans certains ports étrangers et leur utilisation nécessiterait, en sus d'un meilleur étalement des arrivages, la fourniture à l'avance du maximum de précisions, par les patrons de pêche aux armateurs, sur les aires de stockage à prévoir pour le déchargement de leurs apports.

Opérations de déchargement

(a) **Poisson en vrac:** Si l'on tient compte de la conception actuelle des cales avec des sections cloisonnées par des brèzes mobiles, et de l'utilisation de la glace concassée mélangée à poids égal avec le poisson, aucune modification notable ne semble pouvoir être suggérée dans le travail de débarquement.

Cependant, le remplacement des pottes et la généralisation de l'emploi de bacs en matière plastique ont eu l'avantage d'augmenter la propreté et la sécurité, car ceux-ci sont plus faciles à nettoyer et à manipuler. D'autre part, l'augmentation de capacité offerte par ces derniers réduit le nombre des manutentions; celles-ci devraient s'effectuer de préférence avec les grues Haulotte, dont les flèches permettent la prise en cale, le levage et la mise à quai.

De plus, la rupture de charge consistant à verser le contenu des pottes dans des bennes métalliques, après lavage sommaire du poisson pour faire fondre la glace, devrait pouvoir être éliminée. Le débarquement direct des bacs diminuerait le nombre d'hommes et d'heures de travail; au lieu de recevoir une benne de 200 à 250 kg (444 à 555 lb) de poisson, les trieurs recevraient à plus grande fréquence une quantité de l'ordre de 70 kg (155 lb). Ils pourraient ainsi séparer plus aisément la glace du poisson et mieux effectuer le tri en évitant l'encombrement d'arrivées plus massives.

D'ailleurs le lavage du poisson, habitude boulonnaise, devrait être supprimé. S'il facilite le déclaçage et donc le tri et s'il abaisse le poids mort de la glace dans les manutentions, il n'est pas pour autant bénéfique pour le poisson dont il élève la température. Certes, il est illogique de manutentionner un poids de glace superflu, mais la qualité du poisson doit primer toute autre considération. L'eau devrait être réfrigérée, car ce n'est pas l'eau de mer qui nuit à la qualité du poisson, mais sa température. Il convient de noter à ce sujet que l'on envisage à Boulogne de faire des expériences répétées de suppression du lavage du poisson, à des jours fixés en accord avec les mareyeurs. On entirera un enseignement qui permettra de conclure si cette mesure peut être généralisée à toutes les espèces.

L'utilisation de tapis-transporteurs à bandes en matière plastique, alimentés par une trémie où sont déversés les pottes, permettrait de travailler dans de meilleures conditions, d'obtenir un tri plus rapide et plus régulier. D3 essais accomplis à Boulogne n'ont pas donné de résultats positifs. La crainte de suppression d'emplois qui en serait résultée est sans doute à l'origine de cet échec.

La pesée du poisson mis en coffres est pratiquée régulièrement à Boulogne, alors qu'elle n'existe pas dans les autres ports. Certains observateurs pensent qu'elle pourrait donc être supprimée, ou du moins remplacée par des sondages, étant donné que les arrivages de poisson sont plus importants en tonnage et plus faibles en valeur que dans les autres ports; étant donné également la disparition d'assez importantes quantités de poisson au cours de son débarquement, disparition qui tend toutefois à diminuer sensiblement.

Le tri du poisson est effectué d'une manière très poussée. Il semble que, si les exigences des acheteurs étaient moins élevées, on pourrait simplifier ces opérations de tri. Une Commission Boulonnaise étudiera prochainement le problème de cette normalisation. Un Comité restreint proposera aux services de la Halle et au Syndicat des Armateurs de normaliser les différentes espèces en simplifiant le nombre des tailles.

La palettisation des coffres classés immédiatement à l'issue du tri selon la dimension des poissons sur des palettes différentes, lesquelles seraient enlevées par un chariot élévateur effecté à chaque chalutier, et portées aux aires de stockage paraît être une solution rentable en supprimant de nombreux va-et-vient de dockers elle soulagerait ces derniers d'une tâche pénible à effectuer.

On ne peut enfin que se féliciter de l'élimination presque totale des coffres en bois et leur remplacement par des coffres en plastique. En dépit de leur prix de revient plus élevé, les avantages qu'ils comportent sont induscutables: hygiène accrue, économie de poids, et élimination des risques de blessures par échardes ou clous.

(b) **Poisson en caisse:** La mise en ciasse dite d'origine, procédé spécifiquement boulonnais, constitue une méthode très heureuse, tant sur le plan de qualité du poisson que sur celui de la manutention. Il est donc souhaitable que ce procédé soit exploité au maximum.

On a prévu dans certains pays un système d'emballage étudié suivant les normes des cales de navire.

A Boulogne, il pourrait être utile de mieux étudier la forme des caisses, en réduisant notamment leur hauteur pour faciliter le conditionnement. Le gros problème de la généralisation d'emballages standard réside en fait dans le coût de ces emballages; des expériences ont été tentées mais vite avandonnées, étant donné le coût prohibitif des caisses qui ne sont pas récupérées.

Les caisses devraient être déchargées au moyen des sauterelles prévues à cet effet lorsque le niveau du plan d'eau du bassin est favorable appareils qui nécessitent moins de main-d'oeuvre. Actuellement, le débarquement des caisses est effectué trop souvent par palanquées instables au moyen de grues Haulotte qui ne paraissent pas avoir été conçues pour ce genre d'opérations.

Les manutentions relatives au débarquement du poisson conduisent à un coût qui représente à Boulogne plus de 10 pourcent du prix de vente en criée; dans la conjoncture présente et à venir de la libre concurrence du Marché Commun Européen il est nécessaire de rechercher dans ce domaine comme dans d'autres une amélioration de la productivité.

PORT DE CONCARNEAU

Données générales et sommaires sur la pêche et les navires

Evolution des tonnages pêchés de 1938 à 1967:

1938	6.000 tonnes
1950	18.600 tonnes
1960	48.000 tonnes
1964	59.500 tonnes
1967	66.000 tonnes

Prix de vente en halle du tonnage produit en 1967: 117.8000.000 F ($23.560.000)
Prix moyen au kilo: 1,82 F (36 cents)

Lieux de pêche. John Bank—Kinjale—Mine Head—Labadie—Petite—Sole—Grande Sole—Small's—Melville—W. Irlande—Cockburn. La fréquentation de ces lieux de pêche représente des marées d'une durée de 12 à 13 jours.

Flotte de pêche. Chalutiers acier de différents types: Nombre 106: Longueurs 27–30–36–38 m (90–100–120–127 ft). Puissance motrice 450 à 840 CV.

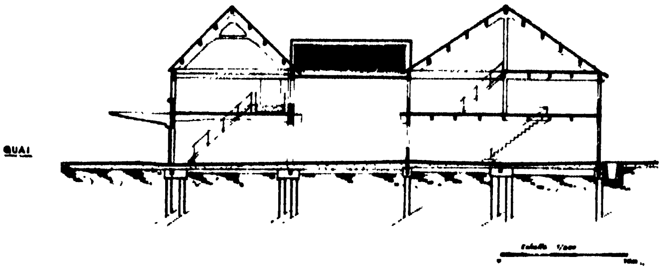

Fig 6. Port de Concarneau. Halle au poisson

Thoniers en acier pêchant à l'appât vivant, senneurs et congelant à bord:
Nombre 27: Longueurs 30–34 m (100–113 ft).
Puissance motrice 450 à 750 CV.
Thoniers de pêche fraîche à l'appât vivant:
Nombre 30: Type 23–26 m (77–87 ft).
Puissance motrice 450 CV.

Méthode de chalutage. Par le côté et par l'arrière.

Poissons pêchés. Ils présentent une très grande diversité, puisqu'on en compte 60 espèces environ. Les principales captures sont composées de: merlus—morluchons de toutes tailles—limandes ou sardines de toutes tailles—limandes-soles—soles—lieus jaunes—grondins rouges—dorades—langoustines—maquereaux, etc.

Sous l'appellation "chaudrée" on trouve des: lottes—chiens de mer—juliennes—congres—lieus noirs—églefins blancs—raises de toutes tailles et toutes espèces—squales, etc.

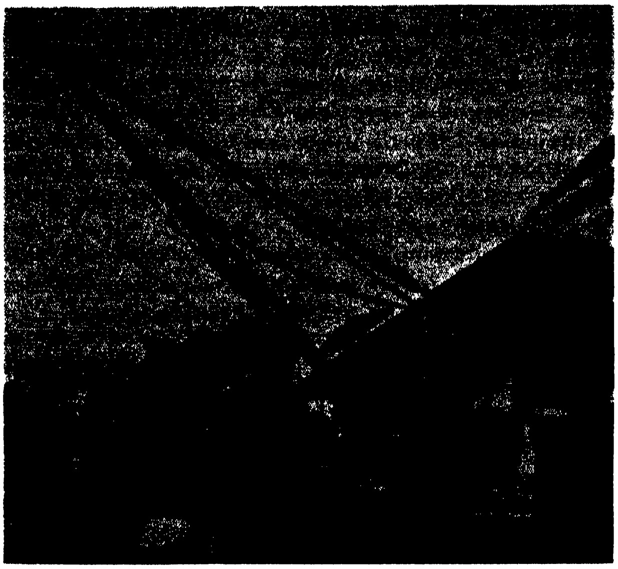

Fig 7. Petite grue de déchargement des chalutiers

Il faut noter que Concarneau est également un grand port de pêches saisonnières: thon et sardine. En ce qui concerne le thon, l'ensemble de la flottille, congélatrice ou non, pratique la pêche:

Pour les congélateurs, toute l'année dans les eaux africaines, pour les bateaux de pêche fraîche, de juin à septembre sur les côtes atlantiques pour la pêche au germon, et de novembre à mai sur les côtes africaines.

Arrivages

16 à 20 bateaux le lundi	(300 à 400 t)
12 à 14 bateaux le mardi	(240 à 280 t)
12 à 16 bateaux le mercredi	(240 à 320 t)
8 à 10 bateaux le jeudi	(160 à 220 t)
6 à 8 bateaux le vendredi	(50 à 80 t)
4 à 6 bateaux le samedi	(40 à 60 t)

La moyenne des apports par bateau varie de: 18 à 30 tonnes (tonnage de pointe: 50 t).

L'époque de pointe des apports se situe d'octobre à juin inclus.

Le Port de Concarneau

Le port est un large bassin de marée. Le prolongement des halles de vente du poisson en 1966 a permis d'améliorer l'amarrage des bateaux pour les opérations de déchargement et ce n'est que dans peu de cas que les bateaux sont placés "en épi".

Fig 8. Débarquement du poisson de chalut

Cependant, d'importants travaux d'extension du port ont été réalisés. Concarneau dispose actuellement, non seuelement d'un très large nouveau plan d'eau, mais également de 500 m (1,666 ft) de quais supplémentaires.

Par ailleurs, le slip-way actuel —(d'une puissance de 350 t)— étant utilisé à la limite de ses possibilités, la construction d'un deuxième slip-way pouvant recevoir des navires d'un poids à lège de 1.500 t est dès maintenant mise à l'étude.

Les halles de déchargement. Elles sont de conception moderne, largement dimensionnées et, sur le plan architectural, présentent un très bel aspect. Elles sont parfaitement éclairées et les revêtements de sols sont excellents. Un très large quai, qui pourrait même apparaître trop large, existe entre les halles couvertes et le bassin. Une telle largeur entraîne en effet un allongement inutile du circuit d'acheminement des paniers, des calles aux tables des trieuses. Ce transfert est présentement assuré par des chariots roulants poussés par un ou deux hommes.

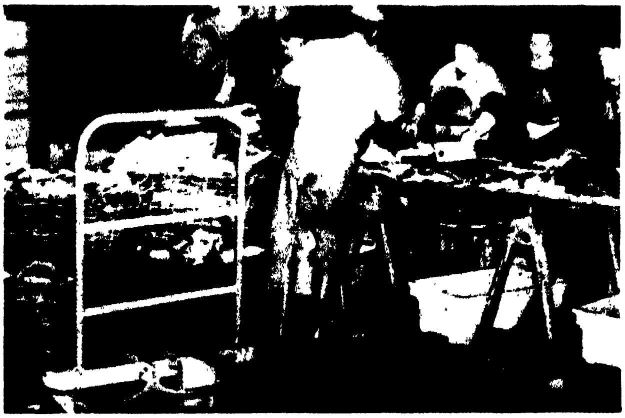

Fig 9. Triage du poisson de chalut

Engins de manutention et matériel de stockage

Il existe au port de Concarneau:

18 treuils à bras de charge et 16 treuils classiques à deux poupées
25 tracteurs électriques
3 tracteurs diesel
1 tracteur à essence
4 chariots élévateurs à fourche
140 grandes remorques
380 petites remorques
150 chariots à main
1 petite grue électrique entièrement automatique (prototype)

Les contenants utilisés pour la manutention du poisson sont tous en matière plastique: (a) Les uns en forme de paniers permettant le transfert du poisson des

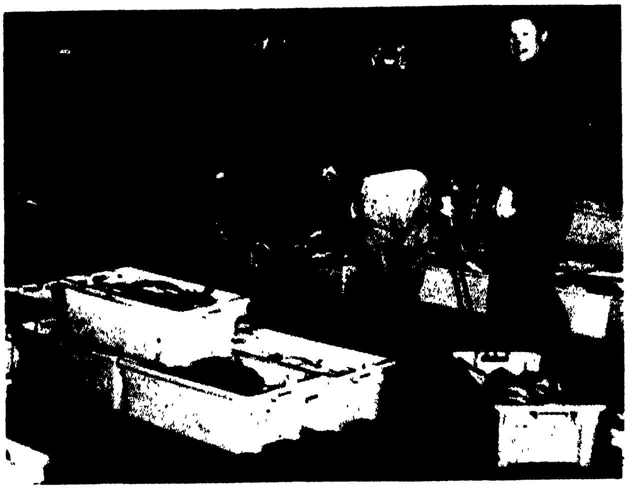

Fig 10. Exposition du poisson pour la vente

cales sur les quais (il en est utilisé 30 par bateau). (b) Les autres sont des caisses formant unité de stockage et de manutention. Quantité: 26.00 0. Ils sont de deux types, d'une contenance théorique de 40 kg (89 lb) pour les plus grands, de 20 kg (44 lb) pour les petits.

La petite grue électrique automatique, citée ci-dessus, constitue le prototype d'un matériel que les Autorités Concarnoises souhaiteraient voir se multiplier. Elle est de conception robuste et quelque peu révolutionnaire, semble-t-il. Sa capacité de levage étant de 200 kg (444 lb) bruts, il devrait être possible de manutentionner directement 150 kg (333 lb) de poisson depuis les cales jusqu'aux abords des tables des trieuses; la durée du circuit aller-retour étant de 40 secondes, on peut escompter un gain de temps de 35 à 40 pourcent environ.

A Concarneau, comme dans les autres ports, les mises au point requièrent de la patience et de la méthode. La marche de cet appareil ne donne pas encore totale satisfaction. Il semble néanmoins que les promoteurs de ce matériel sont dans la bonne voie.

Embauche. Il n'y a pas à proprement parler d'embauche puisque les employés de la Chambre de Commerce et de la SO. DE. PO. le sont à titre permanent- L'horaire de travail des équipes de déchargement est généralement de 0 h à 8 h. Le salaire mensuel moyen d'un ouvrier régulièrement occupé aux opérations de déchargement varie entre 1.000 et 1.500 F. ($200 et $300).

Critiques et suggestions

L'infrastructure portuaire. Elle n'appelle pas en elle-même de critiques particulières et il apparaît que les investissements effectués pour le prolongement des quais sont amplement justifiés.

Opérations de déchargement. Il n'y a que fort peu de critiques à formuler sur la manière dont se déroulent les opérations de déchargement, hormis le handicap que constitue la largeur excessive du quai et qui allonge inutilement le circuit de cale à table de tri. Les responsables du port de Concarneau devront s'efforcer de faire en sorte que le prototype de grue automatique réponde aux espoirs que l'on est en mesure d'attendre de sa mise en service.

Enlèvement après vente. Dans ce domaine, il faut louer l'organisation presque idéale de l'enlèvement des caisses, effectué à quelques pas derrière le crieur assurant les ventes.

La rapidité des ouvriers, et la parfaite synchronisation avec laquelle les remorques sont chargées, les trains formés, l'attelage par tracteur opéré, sont un exemple à méditer par les responsables d'autres ports. Compte tenu de la grande diversité des poissons et des achats clairsemés qu'effectuent les mareyeurs, la palettisation ne semble pas applicable actuellement au port de Concarneau.

Perspectives d'avenir. L'examen de la courbe ascendante suivie par le port de Concarneau depuis la fin de la dernière guerre permet de penser que ce port se réserve de prouver à nouveau son esprit dynamique.

Par ailleurs, il faut noter:

(a) La mise en exploitation depuis le mois d'avril 1965 d'un grand parking couvert pour le chargement à l'abri des camions isothermes et pour les opérations des nombreux mareyeurs ambulants détaillants.

(b) L'étude de la construction d'un nouveau slip-way de 1.500 tonnes.

(c) L'obligation faite aux navires de limiter la durée de leurs sorties à 14 jours, pour une amélioration de la qualité du poisson débarqué.

(d) L'étude en cours pour l'aménagement des cales cales des chalutiers avec containers-tiroirs en remplacement des compartimentages classiques avec brèzes.

(e) La poursuite de la mise au point d'une grue électrique pour le déchargement des cales de manière à accélérer les opérations (déjà évoqué ci-dessus).

(f) La modification du règlement des ventes de manière que le poisson reste le moins longtemps possible exposé sous les hangars.

(g) La mise en exploitation depuis mars 1967 de 500 m (1,667 ft) de nouveaux quais.

(h) L'aménagement d'une vaste zone industrielle de 142.000 m^2 (35 acres).

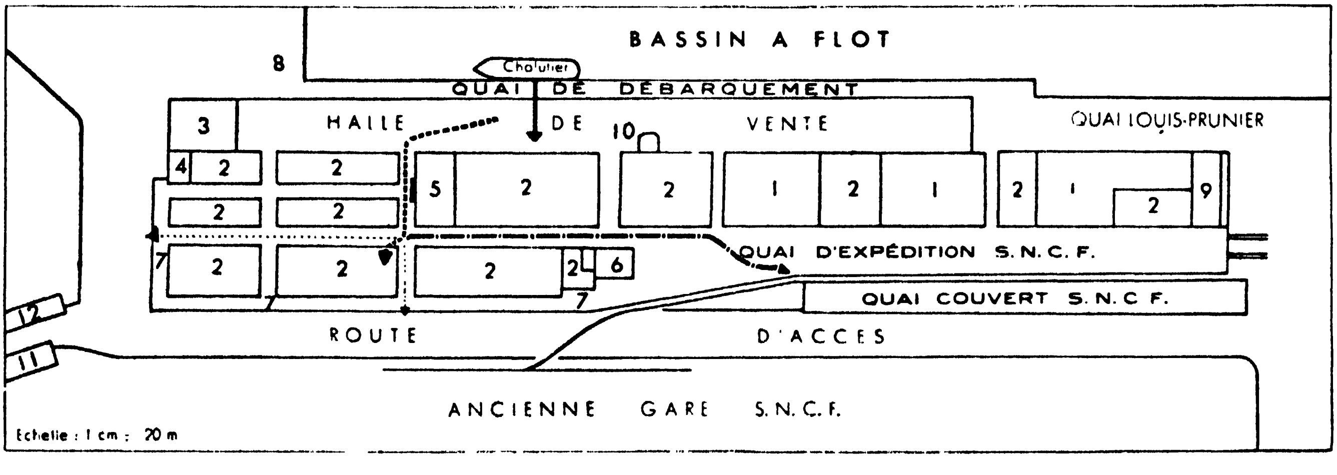

Fig 11. Chambre de commerce et d'industrie de la Rochelle

PORT DE LA ROCHELLE

Données générales et sommaires sur la pêche et les navires Tonnage pêché en 1967: 23.004 tonnes. Prix de vent en halle de ce tonnage: 64.451.460 F ($12.890.292). Prix moyen au kilo: 2,80 F (56 cents) (prix le plus élevé de tous les ports français). Lieux de pêche: Côtes Sud de l'Angleterre—Grande Sole—Canal St-Georges—Golfe de Gascogne—Côte Ouest de l'Espagne et du Portugal.

Flotte de pêche au 1 janvier 1968. 59 chalutiers de 350 à 1.200 CV.
44 chalutiers d'une puissance inférieure à 350 CV.
60 petits courolleurs.

Il convient d'ajouter que, pour des raisons diverses, des chalutiers n'ayant pas leur port d'attache à La Rochelle, viennent néanmoins y débarquer leur pêche. En 1967, 151 chalutiers étrangers au port sont ainsi venus vendre à La Rochelle, soit 68 en provenance de l'Ile d'Yeu, 44 des Sables D'Olonne, 18 d'Etel, et 21 de ports divers.

Méthode de chalutage. Par le côté, à l'exception de 5 unités nouvellement entrées en service et qui pratiquent la pêche par l'arrière.

Poisson pêché. 50 variétés dont les principales sont le merlu, la dorade et la sole.

Conception des chalutiers. Hormis 5 unités récemment mises en exploitation, les chalutiers touchant La Rochelle sont du type classique et dans une large proportion en acier. Les différences qui les caractérisent relèvent plus de la manière dont l'équipage est rémunéré, que de leurs caractéristiques techniques

Les ouvertures de panneaux de cale sont de 0,80 × 0,80 m (2.6 × 2.6 ft) et de 1 × 1 m (3.3 × 3.3 ft).

Les cales offrant des capacités de stockage de 80 à 200 m^3 (105 à 263 yd^3) permettent d'entreposer 30 à 80 tonnes de poisson.

Suivant les navires, la moyenne des apports s'échelonne de 9 à 20 tonnes par marée.

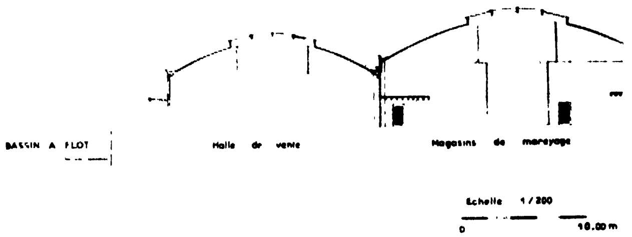

Fig 12. Coupe transversale

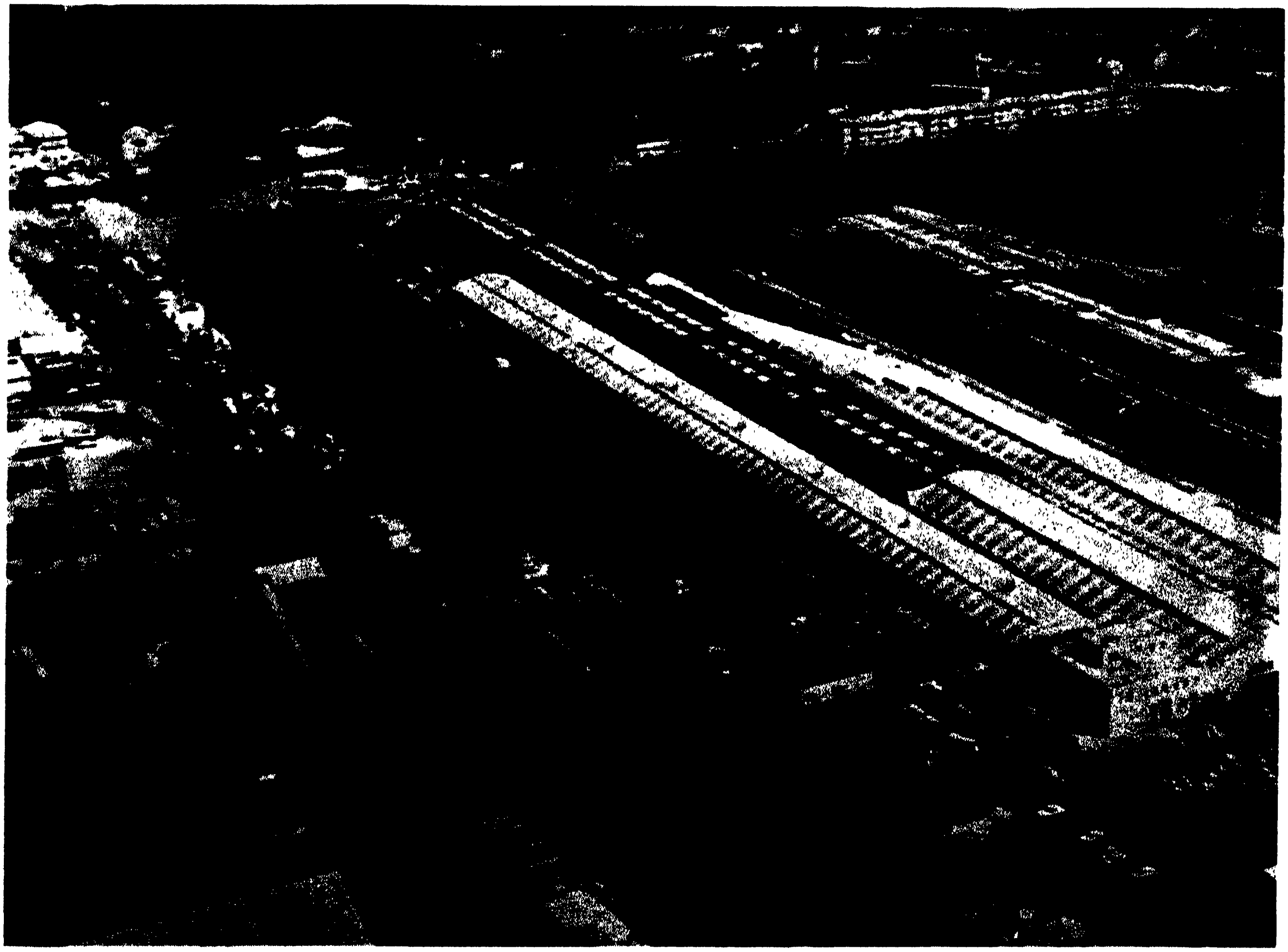

Fig 13. Vue aérienne des installations pour la pêche

Le Port de La Rochelle

Le Port de La Rochelle dispose d'un bassin à flot qui présente l'inconvénient d'accueillir à la fois des navires de commerce et des navires de pêche.

La cohabitation de deux trafics dissemblables dans un bassin trop exigu entraîne des changements de postes fréquents pour laisser la place à un navire de commerce, ce qui entrave les opérations d'avitaillement des navires de pêche.

Lorsque le nombre total des chalutiers pour la vente d'un même jour dépasse 9 ou 10, et cela arrive souvent, on procède à un second our et les chalutiers inscrits pour ce deuxième tour viennent prendre la place de ceux qui ont achevé leur déchargement.

Le parc de matériel utilisé pour la manutention est relativement restreint puisqu'il ne comprend que: (a) 10 treuils; (b) 8 chariots porteurs électriques de 2 t; (c) 22 remorques à attelage automatique.

Pour le stockage, les coffres en matière plastique d'une contenance de 50 kg (110 lb) ont remplacé les caisses en bois réformées depuis 1962

A La Rochelle, puisqu'au moment de la livraison aux mareyeurs, il est procédé à un échange standard des caisses (pleines contre vides), la totalité du stock en service est récupérée aussitôt après la dernière livraison, ce qui permet de les laver journellement, d'une part à l'aide d'un jet d'eau épurée à 7 kg (15.4 lb) de pression et, plusieurs fois par semaine, à la brosse à main, au cours des heures creuses de la matinée.

A noter qu'aucune pesée de ces caisses n'est effectivement réalisée, le contenu de chacune étant estimé à 50 kg (110 lb), et c'est à l'oeil de l'acheteur, au moment de la mise en vente, de l'apprécier le plus exactement possible en fonction du prix offert.

Embauche. Il n'y a pas d'embauche, compte tenu du caractère permanent du personnel.

Critiques et suggestions

L'infrastructure portuaire. Le défaut primordial du bassin à flot est d'être trop exigu et d'abriter des trafics de natures aussi dissemblables que ceux de la pêche et du commerce, dont la cohabitation n'est jamais souhaitable.

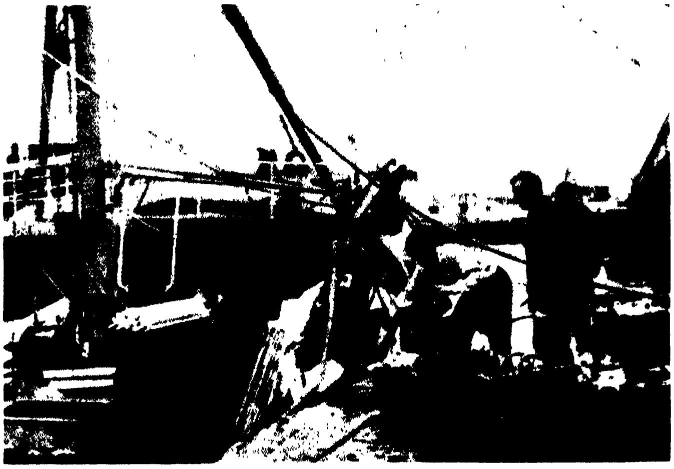

Fig 14. Débarquement du poisson

Cette difficulté atténue incontestablement le bénéfice que le port de La Rochelle tire du fait qu'il est, dans les circonstances actuelles, le seul port français susceptible d'offrir à ses armements des possibilités permanentes d'accostage parallèlement au quai, et à niveau constant.

Opérations de déchargement et d'enlèvement du poisson. Celles-ci n'appellent aucune observation particulière et, là encore, il faut reconnaître que l'extrême concentration des installations pour la pêche—Halle de vente et locaux réservés aux mareyeurs étant localisés en un même point—facilite d'une façon remarquable l'enlèvement du poisson par les acquéreurs.

La mise en service de coffres en plastique a mis un terme aux soucis que causait aux Rochelais, comme à tous les exploitants de ports de pêche, le bois, matériau peu coûteux, mais combien peu recommandé au point de vue propreté, hygiène et sécurité d'emploi.

Des essais sont actuellement en cours pour obtenir le remplacement des paniers en rotin utilisés pour la manu-

Fig 15. Triage du poisson et exposition pour la vente

tention du poisson depuis les cales des chalutiers jusqu'au quai.

Perspectives d'avenir. Si, à La Rochelle le nombre des navires en activité reste à peu près constant depuis quelques années, il n'en reste pas moins vrai qu'il s'est manifesté ici ce qui s'est manifesté ailleurs, à savoir une tendance de plus en plus nette à un accroissement de la taille des nouvelles unités.

Afin de remédier à l'exiguité du bassin actuel, en tenant compte des circonstances présentes, un projet d'extension du port par le creusement d'une darse nouvelle est à l'étude. Actuellement, cependant, aucune décision n'est encore prise quant à sa réalisation.

PORT DE LORIENT

Donnés générales et sommaires sur la pêche et les navires

Tonnage pêche en 1967: (1 mois de grève en février)	56.000 tonnes, dont 24.000 par les bateaux armés à la pêche industrielle et 32.000 tonnes par les bateaux armés à la part.

Valeur globale en halle de ce tonnage: 93.991.289 F ($18.798.258)
Prix moyen au kilo: 1.67 F (33 cents)

Lieux de pêche. Au large et au nord des côtes d'Irlande. Canal St Georges.
Golfe de Gascogne et au large des côtes du Portugal.

Flotte de pêche. Elle est composée de chalutiers en acier et en bois de 25 à 58 m (83 à 193 ft) de construction relativement récente dont l'âge moyen est de 8 ans. On compte 70 unités de moins de 6 ans.

La puissance des moteurs équipant ces navires varie de 450 à 1.450 CV avec une majorité de 600 à 800 CV.

Nombre: 50 chalutiers armés à la pêche industrielle
120 chalutiers armés à la part
100 chalutiers côtiers.

A noter que sont comptés dans la flottille, des bâtiments dont le port d'attache n'est pas Lorient, mais qui viennent néanmoins fréquemment débarquer leur pêche dans ce port.

Méthode de chalutage. Par le côté, exception faite de 10 unités équipées pour la pêche par l'arrière.

Poissons pêchés. Les apports se répartissent de la manière suivante:

(a) chalutiers de pêche industrielle	43%
(b) pinasses	57%
	100%

Fig 16. Débarquement du poisson

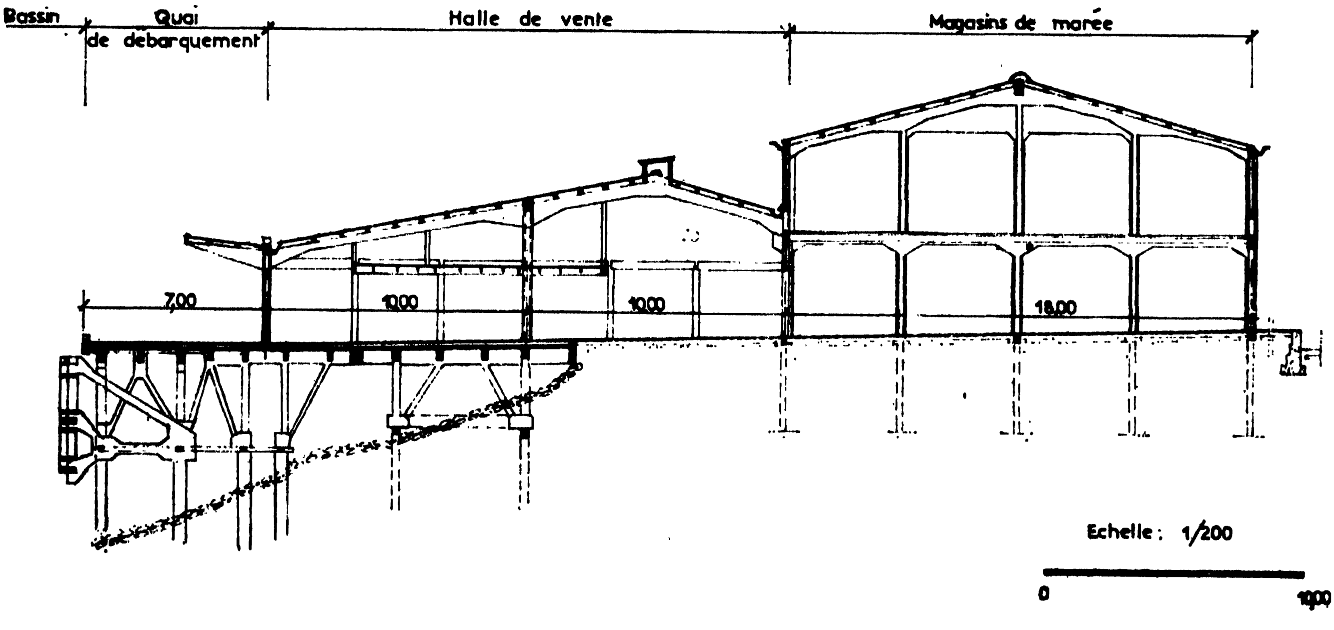

Fig 17. Port de Lorient. Halle au poisson

Ils portent sur une cinquantaine d'espèces, se répartissant par ordre d'importance en: merlus et merluchons, merlans, cabillauds, maquereaux, lieus noirs raies, chiens de mer, dorades, langoustines, les espèces précitées représentant un tonnage d'environ 36.000 t.

On trouve les apports les plus importants en mars et en août, les périodes de pointe hebdomadaires étant par ordre dégressif les nuits de dimanche à lundi, mardi à mercredi et lundi à mardi.

Les halles de déchargement. Situées le long des deux bassins de marée, elles ont une longuer de 600 m (2,000 ft). Elles se caractérisent par une faible hauteur et des ouvertures à intervalles réguliers sur les quais. Elles se prolongent vers les bassins par un quai de 7 m (23 ft) de largeur, en partie recouvert d'un auvent de protection contre les pluies du Sud-Ouest et de l'Ouest. L'éclairage est satisfaisant et le sol, dont la pente est de 2,5 pourcent permet l'écoulement des eaux de lavage et de fusion de la glace vers un caniveau situé entre les halles et le quai et de là vers le bassin. De même une grande partie de la glace mise à terre en même temps que le poisson est rejetée vers le bassin par des trappes aménagées à cet effet dans le sol.

Engins de manutention ou de stockage.

Les appareils. (a) 26 treuils à 2 poupées (2 hommes à la commande du treuil). (b) 14 treuils à embrayage hydraulique (1 homme à la commande du treuil). (c) 13 tapis transporteurs. (d) 13 déversoirs pour tapis transporteurs. (e) 24 chariots porteurs électriques "Fenwick". (f) 11 chariots élévateurs junior Lift 1 t "Fenwick". (g) 8 chariots élévateurs "Fenwick" à petite élévation.

Pour la manutention du poisson, on note: (a) 600 bacs "Tam-Tam" en matière plastique pour le transfert de cale à quai. (b) Des caisses, unités de stockage et de manutention après les opérations de tri, au nombre de: (i) Caisses en plastique 20.000; (ii) Caisses en aluminium 1.500.

Il y a lieu d'ajouter à ce matériel les tables de tri, pour la plupart à caractère fixe.

La main-d'oeuvre de déchargement des chalutiers à la pêche industrielle (SO.DE.LOR.) est composée comme suit:

(a) Dockers-Poissonniers—carte "G"	37
(b) Dockers-Poissonniers—carte "O"	13
(c) Dockers du Commerce, embauchés en cas de nécessité et s'ils n'ent pas trouvé de travail au Port de Commerce:	
(i) Titulaires de la carte "G"	73
(ii) Titulaires de la carte "O"	16
Total	139

Femmes assurant le tri du poisson:

(a) Permanentes	43
(b) Occasionnelles (embauchées lors de gros arrivages)	70
Total	113

Le déchargement des chalutiers armés à la part est effectué par du personnel non docker et non inscrit au B.C.M.O. Ce personnel qui comprend 350 hommes et femmes est rémunéré directement par l'armement.

On peut évaluer à 600 au total, le nombre de travailleurs occupés aux opérations de débarquement du poisson aux périodes de pointe.

Embauche. Pour le déchargement des chalutiers à la pêche industrielle, c'est le B.C.M.O. qui contrôle les opérations d'embauche qui sont effectuées à 17 h pour

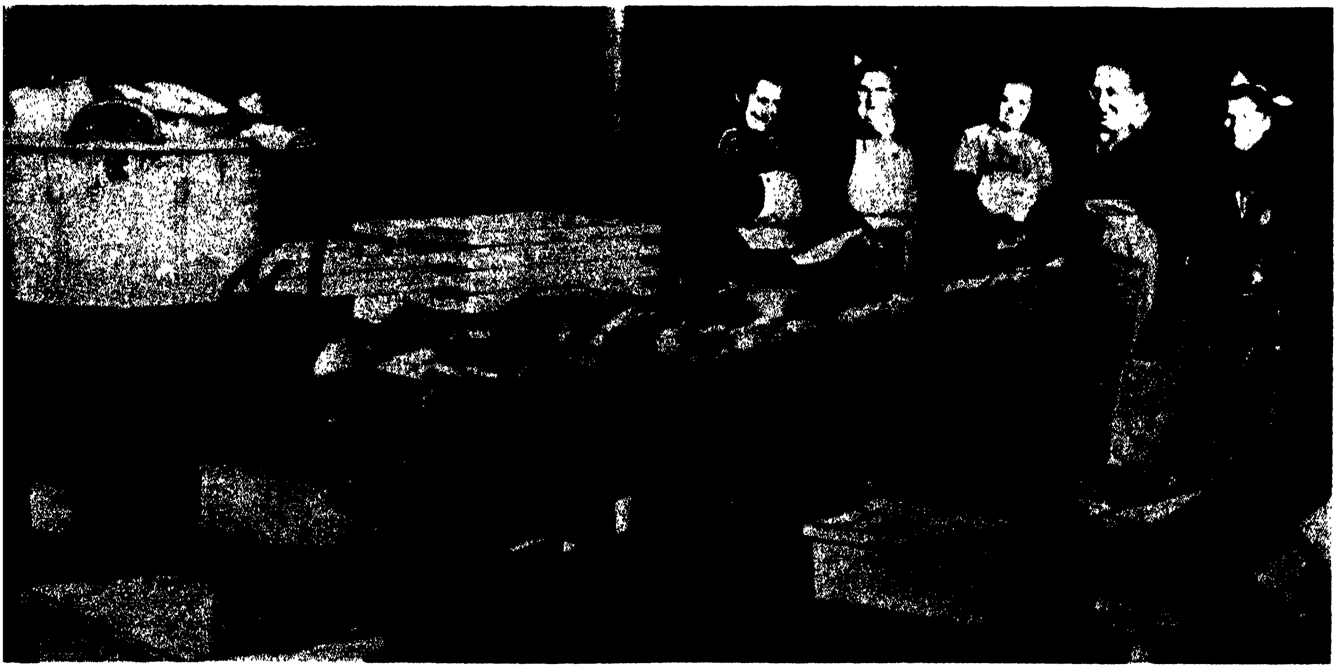

Fig 18. Triage du poisson

le début du travail qui se fait le lendemain matin à 0 h. Elle este faite selon les demandes préalables des intéressés (armement et société du port de pêche de Lorient) et suivant les besoins du trafic.

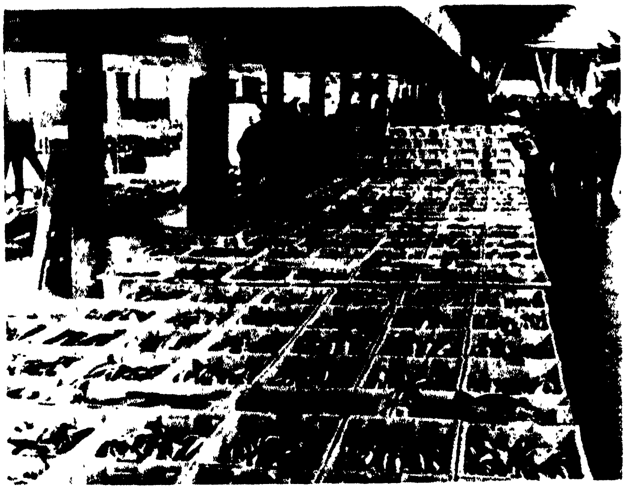

Fig 19. Exposition du poisson pour la vente

Les opérations de déchargement débutent à 0 h celles du tri à 0 h 30. Généralement, elles sont terminées à 7 h exceptionnellement, elles se poursuivent jusqu'à 10 h aux jours et époques de pointe

Critiques et suggestions

L'infrastructure portuaire. L'un des principaux handicaps du Port de Lorient est son exiguité, en dépit de ses 1.800 m (6,000 ft) de quais. Or, tout projet d'agrandissement semble se heurter à de sérieuses difficultés, du fait de l'existence des installations de la marine nationale, proches du port de pêche, et qui semblent promises à un regain d'activité, du fait du transfert vers l'Atlantique d'une partie des forces navales actuellement basées en Méditerranée.

Malgré les inconvénients du marnage sensible (5 m 50 (18 ft)) qui affecte le port de Lorient, il ne paraît pas possible d'envisager l'aménagement d'un bassin à flot qui permettrait aux navires de bénéficier d'un niveau relativement constant, facilitant les déchargements,

Les halles. Bien qu'elles aient, comme dans la plupart des autres ports de pêche, une largeur de 20 m (66 ft), le voisinage immédiat des ateliers de marée rend insuffisante la largeur des halles de Lorient. Lors de gros arrivages, au cours desquels le poisson ne trouve plus de place, on doit attendre que les enlèvements après la première criée soient réalisés pour pouvoir mettre les caisses "en ligne". Mais d'une manière courante, les allées ménagées entre les premières rangées de caisses et les magasins des mareyeurs sont notoirement trop étroites parce qu'elles sont encombrées par les caisses livrées aux acheteurs dont l'activité professionnelle, débordant du cadre trop exigu de leurs magasins, s'exerce d'ailleurs parfois â l'intérieur même des halles Cet inconvénient disparaîtra lorsque les 3.500 m² (0.8 acres) de magasins de marée supplémentaires en cours de construction seront mis en service, c'est-à-dire, au cours de l'année 1968.

Les opérations de déchargement. Celles-ci sont accomplies généralement dans de bonnes conditions. L'affectation du personnel n'est pas immuablement fixée à un bateau et des transferts de personnels peuvent être effectués d'un poste à l'autre.

TABLEAU 1. COÛT DU DÉBARQUEMENT DU POISSON DANS DIVERS PORTS FRANÇAIS
ETUDE FAITE SUR LA BASE DES PRIX 1967
PRIX AU KG DU POISSON DÉBARQUÉ

				Port de la Rochelle	
	Port de Boulogne sur-Mer	*Port de Concarneau*	*Port de Lorient*	*Bateaux Rochelais pêche traditionnelle*	*Bateaux d'Etal Bateaux de la Rochelle utilisant les déglaçeurs*
Dépenses de Personnel (salaires et charges)					
Personnel:					
(a) de la Chambre de Commerce				0,069210	0,069210
(b) surveillants ou pointeurs	0,0101740	0,0012930		0,002780	0,002780
(c) dockers-poissonniers	0,0686756	0,1207000	0,092200		0,043640
(d) commis de quai	0,0100000	0,0028900			
Dépenses de location ou d'utilisation de matériel					
(a) grues treuils appareils de déchargement	0,0061295			0,001400	0,001400
(b) tables de triage					
(c) coffres ou paniers	0,0037504	—0,0009470	0,005200	0,008820	0,008820
(d) chariots de manutention	0,0001837				
(e) camionnage du matériel nécessaire au déchargement ou au camionnage du poisson	p. mémoire				
(f) éclairage des quais—fourniture de courant aux bateaux	0,0009504	0,0003000		0,000530	0,000530
(g) éclairage des halles	0,0017454				
Autres dépenses					
(a) nettoyage des quais	0,0004544	0,0006200		0,001210	0,001210
(b) fourniture d'eau		0,0007070			
(c) divers (patentes, frais de gestions, etc.)		0,0031480	0.000400		
Totaux	0 F 1020634	0 F 131705	0 F 097800	0 F 083950	0 F 127590
Prix moyen du kg de poisson débarqué	1 F 04	1 F 82	1 F 67	2 F 80	
Pourcentage des prix de manutention	10%	7%	6%	3%	5%

Les efforts entrepris pour rationaliser la manutention en améliorant les conditions de travail et en diminuant le nombre du personnel ont abouti à la formation d'équipes dont la composition est la suivante:

(a) 3 caliers; (b) 1 chef de panneau; (c) 1 laveur; (d) 1 accrocheur-basculeur; (e) 1 treuilliste manoeuvrant un treuil à embrayage hydraulique; (f) 2 metteurs en ligne; (g) 7 trieuses.

soit au total 16 personnes contre 19 dans les anciennes équipes qui s'augmentaient de deux rouleurs et de 1 treuilliste supplémentaires.

D'autre part, la conception même des halles de Lorient, qui présentent l'avantage d'être construites en appontement sur le bassin même permet le déversement automatique de la glace débarquée, en même temps que le poisson, en aval du circuit après le tri. Quant aux opérations de déglaçage en cales, elles ne semblent pas appeler de remarques majeures.

Perspectives d'avenir. Sous réserve de quelques critiques formulées précédemment ayant trait à la pénurie en postes d'accostage et en surface sous halles, Lorient donne l'impression d'un port fouetté par de vives ambitions, qui plus est, concrétise certains de ses ambitions.

Lorient est:

(a) Le premier port français de pêche qui ait mis en chantier et exploité un navire chalutant par l'arrière.

(b) Le premier port qui ait effectué des essais pour assurer une manutention continue de cale à quai.

(c) Le premier qui, avec 14 chariots élévateurs à fourche, effectue des transports palettisés.

Mechanical Unloading of Fresh Fish at Bremerhaven: WACO Fish-lifter for Fishing Vessels

by H. Meiners

Déchargement mécanique du poisson frais à Bremerhaven: Le monte-charge a poisson WACO pour les Bateaux de Pêche

Après avoir rappelé l'augmentation du coût de la main d'oeuvre enregistrée en Allemagne au cours de ces dernières années, ce document décrit la mise au point et le fonctionnement d'un système mécanique de déchargement pour le poisson frais, utilisé à Bremerhaven. Il décrit également le rôle joué par le travail mené en coopération par un certain nombre d'entreprises de Bremerhaven, y compris des chantiers maritimes, dans la mise au point de ce nouveau système.

La caractéristique principale de ce système est l'inclusion dans les plans de construction du bateau d'un transporteur installé dans la cale à poisson, et l'installation d'un monte-charge pour soulever le poisson au niveau du pont. On décrit le fonctionnement de ce système.

Lorsque le poisson a atteint le niveau du pont, un transporteur d'une conception spéciale l'envoie dans la halle du marché; ce système comporte un dispositif spécial pour la séparation de la glace et le triage du poisson. Ce système permet en outre la manipulation de poissons d'espèces et de tailles différentes et comporte également un dispositif très intéressant pour la manipulation des caisses à poisson. Ce système est également muni de dispositifs pour le pesage automatique du poisson.

Le document conclut en mettant en lumière l'économie considérable de main d'oeuvre réalisée par l'adoption de ce système, en comparant ce dernier avec les méthodes courantes de déchargement du poisson frais et fait état des conclusions auxquelles est parvenue une Commission technique sur la mécanisation des systèmes de déchargement. Cette Commission a conclu que les résultats obtenus par ce nouveau système justifient pleinement la dépense accrue de capitaux qu'il a comporté et recommande que les bateaux actuellement en construction en Allemagne installent ce système dans leurs cales à poisson. Le nouveau système pourrait également être adapté aux bateaux actuels.

Descarga mecanica del pescado fresco en Bremerhaven: Montacargas "WACO" de pescado para los Barcos de Pesca

Después de exponer sucintamente el aumento registrado por el coste de la mano de obra en Alemania estos últimos años, el documento describe la construcción y el funcionamiento de un sistema de descarga mecánica del pescado fresco que se utiliza en Bremerhaven. Se describe también la colaboración entre muchas compañias de Bremerhaven, entre ellas los astilleros, para la creación del nuevo sistema.

El rasgo característico del sistema es la inclusión, en el diseño del barco, de un transportador en el propio cuarto del pescado, con un montacargas para subirlo hasta la cubierta del barco. Se describe el modo de funcionamiento.

Una vez el pescado en el costado del barco, un sistema de transporte, especialmente concebido lo conduce al mercado, y al mismo tiempo lo clasifica y lo separa del hielo. El sistema es ajustable, para que puedan transportarse pescados de formas y tamaños distintos, y está dotado de un dispositivo para la manipulación de las cajas, muy cómodo. El sistema está también provisto de un dispositivo de pesaje automático.

Se describe, por último, el considerable ahorro de mano de obra que se consigue con este sistema en comparación con los procedimientos de descarga usuales del pescado fresco, y se reproducen las conclusiones de una "Comisión Técnica de Mecanización de los Procedimintos de Descarga"; según esta comisión, los resultados prácticos obtenidos con este sistema justifican plenamente los mayores gastos de capital, y recomienda que los nuevos barcos que se construyan en Alemania estén normalmente dotados de este tipo de instalaciones en el cuarto del pescado. Es también posible su adaptación a los actuales barcos.

THE technique of unloading fresh fish has remained unchanged for decades, especially owing to the construction of fishing vessels. Vessels of different size are mainly unloaded by manual labour using winches, shipboard implements and containers (cases, baskets, pails, etc.), not only in the Federal Republic of Germany but also in all other fishing countries. This wage-intensive procedure depending on manpower has become increasingly expensive in Germany, particularly as a result of considerable rises in wages after the currency reform and the increase in landing charges related to it. Apart from the greatly increased costs, the shortage of manpower has become the central problem of the Germany economy, especially of German fisheries which for various reasons have been unable to benefit from the "economic miracle" in the same way as other sectors of the economy. This fact has mobilized all the forces of fisheries for rationalization and mechanization to achieve competitive production. In the past 15 years, the four West German sea-fish market companies have made considerable investments in an attempt to solve the problem of "mechanized unloading". Except for some partial success in improving unloading technique, these endeavours had been unsuccessful, especially in view of the conventional construction of fishing vessels.

A NEW UNLOADING SYSTEM

Hochseefischerei (high-sea fishing company) Kämpf and Co. KG (Kommanditgesellschaft—limited partnership) of Bremerhaven, Rickmers Shipyard of Bremerhaven, Industrie- und Handelszentrale (Industrial and Commercial Centre) Walcker and Co. KG of Loxstedt/Bremer-

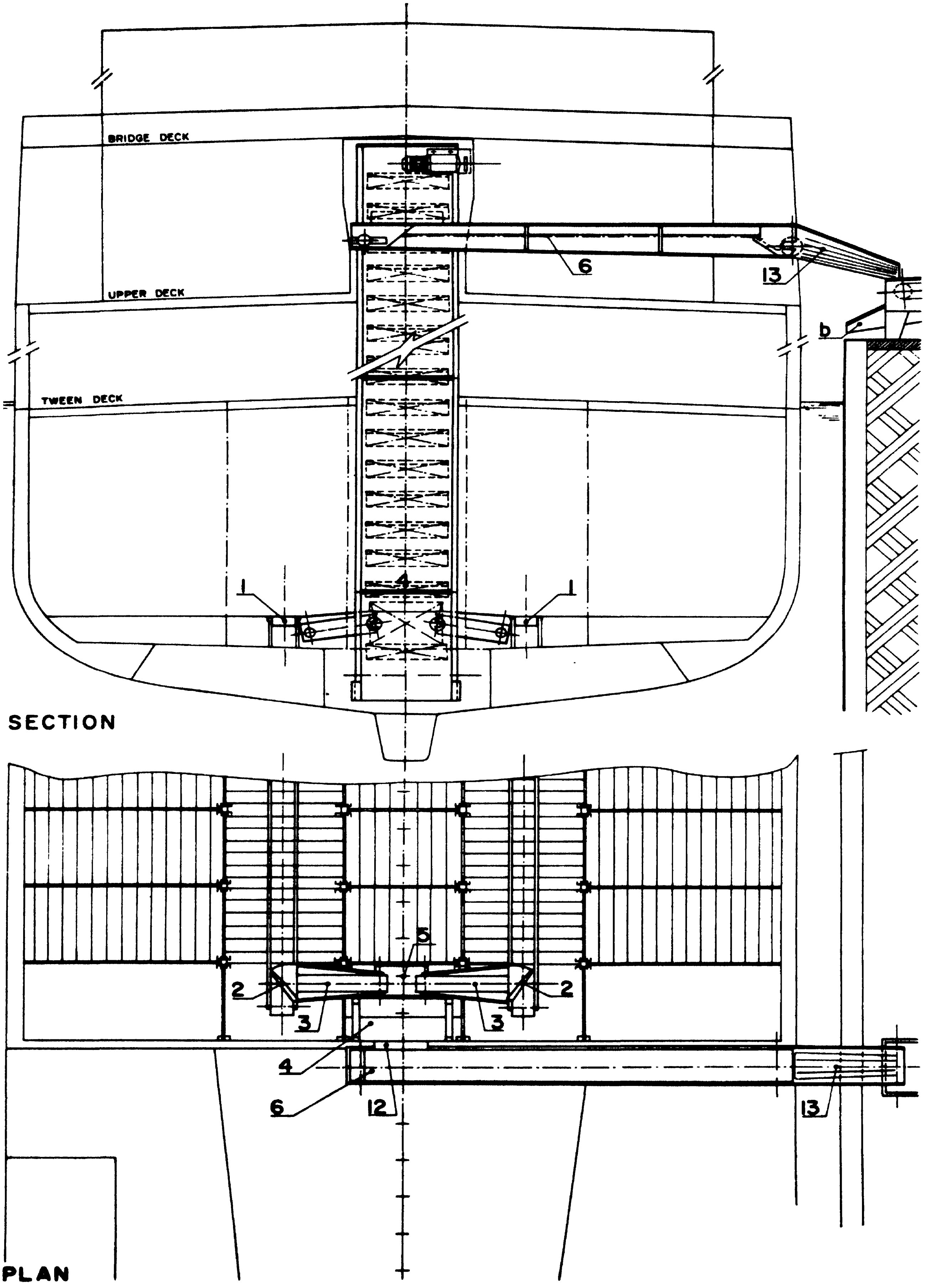

Fig 1. "Waco" fish lifter installed on board the fishing vessel. (Numbers referred to in text)

haven and Fishing Port Management Company Ltd of Bremerhaven have developed a high-capacity unloading installation for the new fishing vessel FMS Seydisfjord ordered from Rickmers Shipyard. A revolutionary innovation, equipped with conveyor belts and elevator, it promises to rationalize and mechanize the entire unloading operation, provided that fishing vessels commissioned in future are similarly equipped.

In close cooperation with the practical fishing experts of Kämpf and Co. and Rickmers Shipyard of Bremerhaven, Industrie- und Handelszentrale Walcker and Co. KG of Loxstedt/Bremerhaven first developed an elevator to be set up on board. A decisive factor in realizing this project was the construction of a vertical installation of sufficient capacity because the capacity of steep conveyors built hitherto would have been insufficient to transport the relatively big quantities of fish. Walcker and Co. managed to achieve the decisive solution by building a bowl conveyor operating vertically—the so-called "WACO fish-lifter".

The installation is designed to mechanize the various phases of unloading as much as possible with minimum employment of manpower, while treating the extremely delicate commodity with great care. To obtain maximum utilization of the mechanical equipment, this called for changes in the customary unloading technique. The sequence and system of unloading operations must be adapted to the function of the mechanical installation.

Detailed description

The figures show the construction and operation of the whole plant:

It consists of the fish-lifter installed on board (fig 1) with an additional conveyor, and mechanically operated unloading equipment (figs 2–3).

According to the drawing, the installation on board consists of two conveyor belts (1) fitted longitudinally near the bottom of the fish hold, which convey the fish into the bowls of the WACO lifter (4) via skimming stations (2) on connecting belts (3) athwartships and through a feeding funnel (5). The lifter empties its bowls above the upper deck on to a conveyor (6) athwartships, and this conveyor moves the fish to the ship's side and, on a slide, to another conveyor plant on shore.

The equipment described develops 17 electric horsepower, with a theoretical unloading capacity of 120 m^3 (171 yd^3) per hour.

The conveyor belts (1) in the fish hold are 300 mm wide; the bowls of the WACO lifter have the following size:

length:	1.2 m (4.0 ft)
width:	0.4 m (1.3 ft)
maximum height:	0.3 m (1.0 ft)

Thus, the biggest specimens of cod and similar big fish can be handled. The conveyor on deck (6) is 500 mm (1.7 ft) wide to cope with the combined flow of both belts (1). The speed of the belts is 0.5 m (1.7 ft) per second, that of the WACO lifter 0.4 m/sec. (1.3 ft).

The arrangement of the partition planks in the fish hold differs from the usual system: the planks above the belts (1) have to be arranged athwartships, those in the compartments at the sides of the belts in the fore-and-aft line.

The conveyors are supported by strong steel girders and are directly covered by boards so that the belts can move freely under the cargo of fish piled up above the conveyors.

Method of operation

Unloading starts in the section where the fish-lifter is located (it may be installed fore or aft in the fish hold). The first vertical partition planks are pulled upwards above the belts (1). As more planks are removed, the cargo forms a slope and slides on to the conveyor belts which move it to the lifter (4).

The men engaged in unloading thus proceed alongships, pulling out the planks above the belts (1); in this way, which does not require much labour, they also empty the port and starboard compartments as they move along.

This makes it even possible to carry out some preliminary sorting by unloading this or that compartment earlier or later.

It should be pointed out that fish and ice are moved altogether. It is noteworthy that the fish flows on to the conveyor belts on its own slope and need not be pulled out singly with fish hooks from the ice. Apart from the first fishes which have to overcome a certain fall height, the bulk of the cargo is moved almost without jolts because all stages of transport are more in the nature of a gliding movement.

For simplicity's sake, the extracted planks are piled on the girders of the compartments.

QUAYSIDE INSTALLATION

The WACO shore installation has been developed for transport on shore. It is designed to receive the fresh fish, which leaves the installation on board without containers and provides for economical distribution or sorting and distribution, including weighing in boxes for auction, of all types of fish. This had to take into account the fact that the WACO equipment on board discharges fish together with ice and that, apart from herring, the ice must be removed as much as possible from the fish prior to sorting and distribution.

After long intensive work calling for special technical measures, Walcker and Co. succeeded in solving this complex problem of unloading, distribution and sorting to a great extent.

As with the shipboard equipment, the shore installation required changes in the customary technique to obtain optimum capacity by adapting operations to the function on the installation.

According to the drawing (figs 2-3), the shore installation consists of a conveyor (a) on the pier, built especially for all kinds of fish that have to be separated from ice. The mixture of fish and ice slides on the ship's slide (13) to the upper part of a wide-meshed sieve belt of the conveyor (a). The mesh retains the fish but the pieces of ice drop through it. They are caught by the slide-shaped bottom (b) of the belt and carried into the harbour by the lower part of the conveyor moving backwards. The fish is taken up by the conveyor belt (c) and carried either to the distributing stations (d) or past the sorting stations (f) if sorting is required.

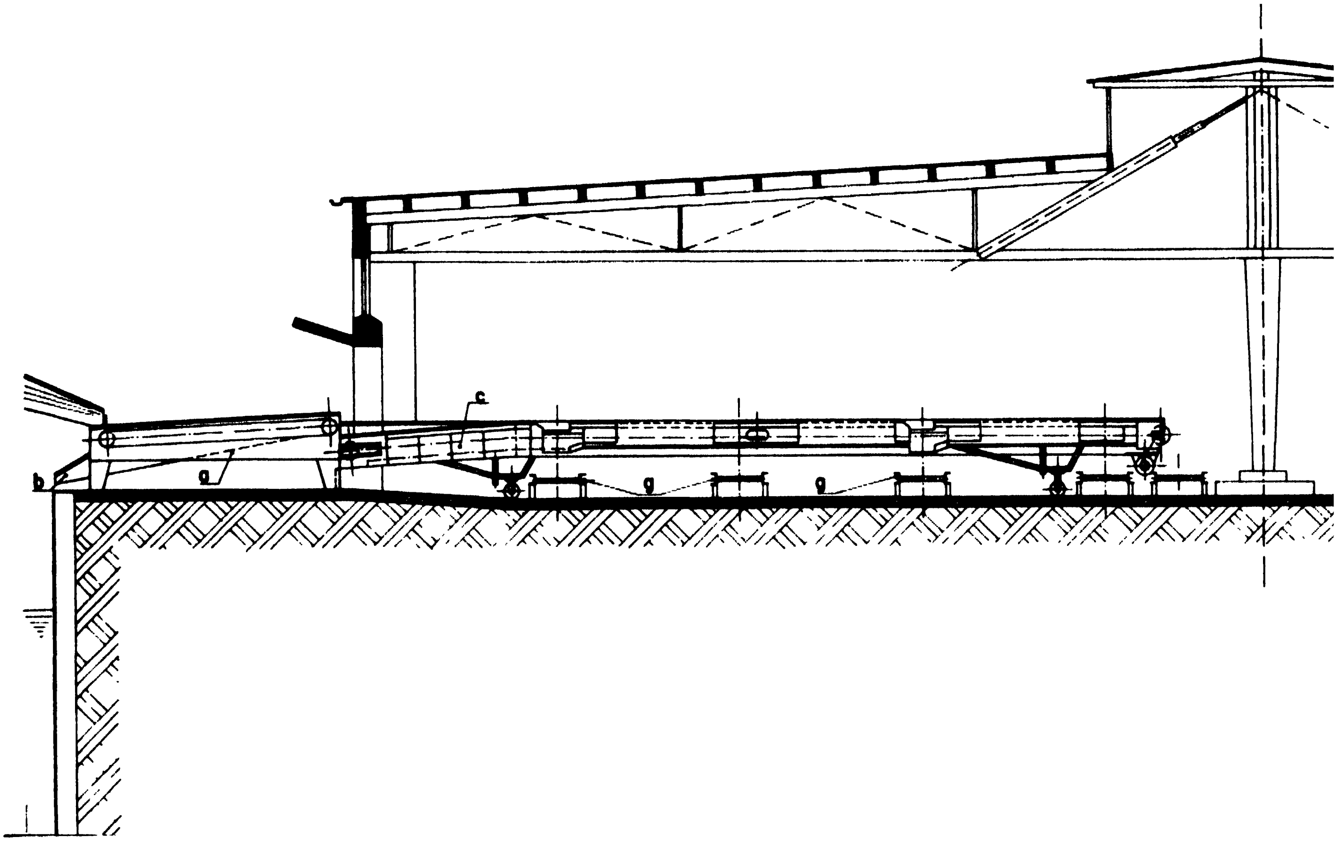

Fig 2. Section of dockside unloading and distribution conveyor system

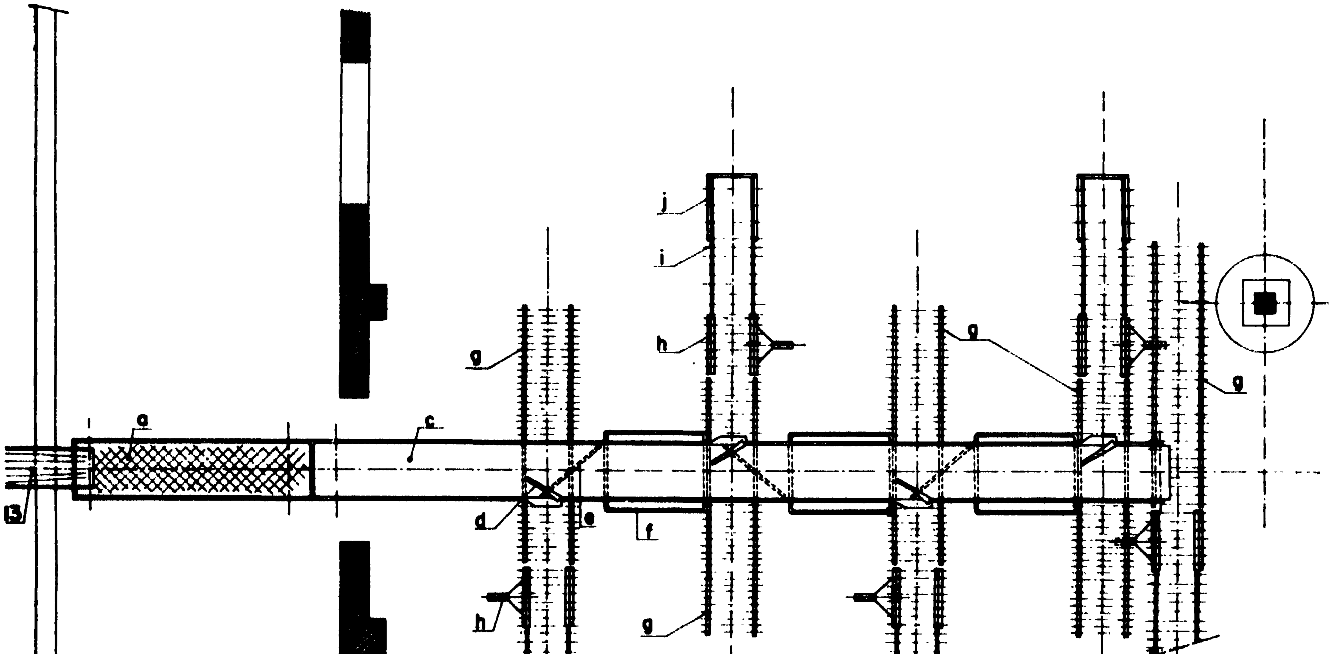

Fig 3. Plan of dockside unloading and distribution conveyor system

Method of operation

The procedure for fish to be distributed or sorted and distributed is as follows:

Bulk fish of the same size and herring generally are weighed in boxes and sent on for auction without sorting.

These two types of fish are received from belt (a) by belt (c) and sent to the skimming stations situated above the upper part of the conveyor belt. These skimmers (d) can be inserted into the width of the conveyor belt (c) in a continuously variable manner as desired and can be stopped. Thus, the stream of fish moving on the whole width of the belt can be branched off according to width for the desired distribution and packed in boxes (not shown) by way of the slides of the skimmers (d).

Gutted lean fish such as cod, haddock, etc., requires sorting. In this case, the skimmers (d) are closed and the stream of fish is moved past the distributing stations (f).

The special nature of the conveyor (c) and the distributing stations (f) consists in the fact that the upper part of the conveyor (c) delivers the fish and the lower part carries the fish to fixed skimmers (e) which send it over skimming slides to a waiting box. At the sorting stations (f), sorters select the fish according to size from the stream of fish and simply put it into the slide openings of the sorting stations (f) whence it reaches the lower part of the conveyor

As a result of this technical solution, several sorters can be employed simultaneously to fill a box, without hampering each other. Furthermore, this largely prevents fatigue through physical effort because the sorters only have to take the fish from the belt and put it into the slit of the slide directly before them. There is an additional advantage; the great reduction in manual labour enables each sorter to concentrate on observation of the fish sizes.

The speed of the conveyor belt (c) is adjustable to adapt it to the various operations.

Roller tracks arranged transversely under the conveyor (c) deal efficiently with the transport of boxes—to bring up empty boxes, place them in position for filling, weigh the packaged fish, and prepare the boxes after weighing for fork-lift trucks. The roller tracks take the empty boxes on section (g) and keep the last box in position for filling at the scales (h) by means of a stopping pedal under the skimming slides (d and e). The worker at the scales (h) operates the pedal in such a way that the filled box rolls on the scales (h) and the empty box rolls up to the stopping device and is kept in position for filling. The worker weighs the fish on the scales (h) by adding fish to, or taking it from, the box. After weighing, the box moves on section (i) of the track to the receiving station (j). Section (i) also serves as a reserve stretch in case the receiving station (j) is not yet ready for another box coming from the scales (h). The receiving stations are built in such a way that the box there can be seized under its bottom and lifted by the blades of the transport truck.

Alternative arrangement of the tracks makes for efficient transport of full and empty boxes. Looking in the direction of the conveying stream, the stations are alternately on the left and right of the sorting and distributing conveyor belt (c).

As a result, a truck can deliver empty boxes to a track and receive full boxes from the track next to it.

For practical erection and dismantling of the shore installation, the conveyor belts (a and c) are self-supporting structures and easily movable on undercarriages with swivel rollers. The roller tracks (g, h, i and j) are linked as units by means of coupling elements, but can be separated into their components for easier transport.

LABOUR REQUIREMENTS

In short it may be said that the automatic skimming stations make for considerable saving in manpower in the unloading of fish of the same kind and size which does not require sorting, whereas this saving is reduced by the required sorters for mixed cargoes. Female auxiliary labour might be employed for the sorting work made easier by this equipment.

With normal processing on board—commercially customary icing and salting of less than ten per cent for herring—the whole plant described permits 50 tons to be unloaded in one hour. For this capacity based on piece work, 33 men are needed for four weighing stations. However, the most economical form of unloading is achieved with three weighing stations (27 men) because the men then attain a work period which, depending on a vessels total catch, corresponds to a normal shift of about seven hours.

By way of comparison, the conventional method of unloading requires 60 workers for about 250 tons. Thus, elevators result in considerable savings. Since the unloading of fresh fish is a very wage-intensive operation, the reduction in costs may be put at 35–45 per cent, depending on the composition of the catch.

CONCLUSIONS

A "Technical Commission on Mechanization of Unloading Procedure" thoroughly investigated the experiences gained with this new equipment. It grouped representatives of shipyards, ship-owners and marketing companies and worked closely with the fisheries expert of the Land of Bremen as representative of the coastal Lands. In its very extensive work, the commission also considered the results obtained with two elevators in a new fresh-fish vessel of the Hanseatische Hochseefischerei AG of Bremerhaven (Hanseatic High-Sea Fishing Joint-Stock Company).

The commission is of the opinion that an elevator greatly simplifies the handling of fish on board (by facilitating the trimming of ice in the fish holds, and saving in manpower in the case of big catches) and makes unloading more economical, mainly by reducing the number of workers. Mechanical unloading equipment eliminates hatches which sometimes are very troublesome, thereby considerably improving the design of new trawlers.

In view of the remarkable advantages of this unloading equipment for the transport of fish as a whole, the commission has recommended that new vessels for fresh fish and fresh herring should be fitted with fish-lifters of this tested type. In doing so, the commission believes that the effect of rationalization certainly warrants the higher cost of investment. The commission also considers it possible in principle to install such equipment on board German high-sea fishing vessels already in operation. But the implementation of this measure would be mainly a question of profitability.

In conclusion, it is stated once again that the development of the fish-lifter for fishing vessels, together with the complementary shore installations, is an essential step toward the mechanization of unloading procedures and thus toward a reduction of landing charges.

DISCUSSION

Unloading and handling and supply facilities

Bruski (Poland) said that no final answer had yet been found to the problem of unloading and handling. Various methods had been used, e.g. cranes and conveyor belts. When Poland started shipbuilding, Polish engineers tried to find out whether it would be possible to have new designs for handling on the ship, and whether it would be possible to have a side entrance into the ship direct from the quayside. The ship must be built and laid out in such a way that it can be practically self-unloading, and the whole unloading and handling process should be mechanized as far as possible. As far as the supply was concerned, there should be a constant contact with the ship by radio, so that information could be given as to the catch. In Poland service organizations collected all the news from the ships, thereby knowing the quantities to be delivered in the ports and the facilities required. He also stressed the importance of supplying the ships with provisions in an efficient way. The organization of the labour force should also be given special attention. A centre for the study of these problems, apply ing also to electronic equipment, had been set up in Poland. The processing plants in Poland had become very market-oriented of late. The question of the co-ordination of all the functions in the port deserved special attention. In fishery ports, the problems would differ as to whether the ports handled frozen fish or fresh fish, or both. The solution to these problems must be secured by mathematical methods, as shown in Madziar's paper (Session II) which described some aspects of operations research in the planning of fishing harbours in Poland.

Useful fish lifter

Cox (UK) said that he was interested in the Session VIII paper by Fishing Port Management Co Ltd—a description of a new mechanical unloading lift system, the Waco fish-lifter, for fishing vessels. It had not been possible to see the landing of vessels during the visit to Bremerhaven but the method of unloading fish was of great economic importance, especially at the larger ports. In the paper by Cox (Session IX), reference was made to the existing archaic method of landing at Hull and to the examination of the problem of mechanical unloading. A lift and conveyor system was found suitable but it was not practical to introduce it because of high installation costs and inadequate market structure. The system Hull planned was for present conventional type trawlers of over 165 ft in length, whereas the WACO fish-lifter at Bremerhaven was a "revolutionary innovation" and was for a new design of fishing vessel. There was an urgent need for economical mechanical unloading at the larger ports to step up effective productivity. Here was a problem for the engineers but unless an answer were forthcoming quickly, it would be useless because in the next decade conventional trawlers in Hull would be few in number and then the real need and benefit would be gone. The structure should be of light design and economical to operate with a minimum of manpower to reduce ever-increasing labour costs.

Germany's unloading problem

Meiners (Federal Republic of Germany) stated that the problem of mechanization and improvement of the unloading of fishing vessels was not a new one. In the four fishing ports of the Federal Republic of Germany, in particular Bremerhaven, this problem had been considered at great length. A solution could only be found if there was a close co-operation between the deep sea fishery and marketing companies with participation by the fishing port authorities. On this basis a Technical Commission on the Mechanization of Unloading Procedure had been set up at Bremerhaven to develop a mechanical unloading system for fresh fish. The installation of the WACO system on board two newly constructed ships, was very successful. Care should be taken to deal only with fish of the same size and species as the use of the installation was more difficult when dealing with mixed fish of different sizes.

With regard to savings in labour and costs achieved by this system, the results obtained in practice fully justified the increased capital expenditure. Newly-built vessels in Germany should, he felt, install the fish room installations as a matter of course. It was also possible to convert existing vessels. This system would also show an important improvement in the work load on the workers. The speaker also mentioned briefly problems regarding frozen and salted fish, and said that besides fresh fish, in a number of ports there existed extensive unloading of frozen and salted fish. For this type of unloading, special measures were needed and this, again, was done in close co-operation between the deep-sea fishing and marketing companies. Special unloading facilities therefore had to be developed for salt fish and frozen fish making use of cranes and a conveyor system which really had proved to be very useful.

Work study urgent

Hovart (Belgium) said that the object of work study should be the efficient employment of manpower by improvement of working methods, and investigation of the factors affecting rationalization. In concrete terms, the aim should be to simplify and reduce the heavy work of unloading, to achieve a saving of labour and of costs, to secure a more rational handling and encourage a more rational mechanization. The speaker said that most studies on unloading, an expensive and labour-consuming process, were based on qualitative observations; at the very most an overall time-determination was made of the work cycle. No figures were compiled on overall labour efficiency in discharging a ship, nor was the degree of employment assessed. In the technical "revolution" of fisheries, this must be said to be a deficiency. To remedy this, it was essential to conduct work studies in two parts, one being concerned with **method investigations** and the other with **time measurement.** The first part would comprise the critical and systematic determination, analysis and examination of existing and planned working methods, aimed at improving them so as to arrive ultimately at a more efficient and simpler working method.

The time measurement would consist in the application of certain techniques with the object of determining the work content of a particular task by time measurement. The method study would be of a qualitative nature, whereas the time measurement would stress the importance of quantitative data. A close link must exist between these two factors.

On the basis of the work-analysis diagram, examination of the existing working methods and working conditions should be carried out. It was necessary to put a number of questions, and from the answers an attempt should be made to devise and crystallize new functions and working methods which would enable working conditions to be improved. The time measurement method must aim at fixing the time for each operation to eliminate unproductive times.

Time measurement should be carried out in both the original situation and the new job function. In this way, it should be possible to appraise the new working methods as compared with the reference basis, determine the gain or loss of time, and also show the degree of employment.

If the study would yield a gain in time and if the degree of employment could be improved, the working method could be stabilized and introduced. This might result in more rational unloading arrangements, for which not only observations, but also statistical data would be available as a basis. In Belgium plans existed for carrying out work studies on unloading fresh fish at the Port of Ostend.

Automation for France

Marchal (France) said a French automation company was studying a system for the automatic transportation of tuna from the vessel to the frozen fish depot and to direct the fish to a freezing chamber according to its quality. This installation might also include automatic weighing and automatic stock taking, giving, at the same time, the date of arrival in the depot. This method might be applied for other species of frozen fish. It was not possible at this stage to give an estimate of the costs of this installation, but if the unit quantity to be weighed was less than 100 kg. the price would be fairly reasonable. The company in charge of the project was trying to reduce the price as much as possible.

Yoshikuni (Japan) said that the mechanization of unloading of fish from diversified coastal fisheries would be very difficult. He mentioned that, in Japan, several tests had been made in this field. Pumping fish ashore had proved successful, but only for fish that was processed. For fresh marketing, any damage to the body and skin of fish caused by mechanization would be seriously detrimental to the price, since the Japanese housewife inspected the fresh fish whole before she bought it. When the consumers had this strong preference for a good appearance of fish as a sign of freshness, mechanization became even more difficult and he stressed the importance of more studies being made in the mechanization of unloading by small boats.

Problem of weighing

Campleman (FAO) said that in handling from ship to market display, the weighing of the fish was a major block. He requested opinion as to whether there were better methods than the present scales for obtaining unit quantities, as for instance, in-line automatic weighing systems. Most sales of white fish were made by weight, and they might consider the comparative virtues of sales either by weight or by unit volume.

Goldet (France) said that in France, tests showed that if the weighing was not correct this was partly due to the operator being inattentive, and partly also to the balance not being well enough adjusted. Under these conditions the operational error was very often greater than the estimation of weight by sight made by an experienced operator. He mentioned that when fish was sold by auction it was inspected at the same time as the weight was estimated, and consequently, the experienced buyer would not be likely to be mistaken about the weight. It was also possible, when the fish was transported by waggon lifts, to adopt a weight indicator on the forks. The weight of the fish varied fairly quickly according to the time factor involved. It was therefore necessary to know exactly when the operation had taken place. The speaker finally pointed out that the weighing of fish had been suspended all over France, except in Boulogne.

Concern of small ports

Lomeli Delgado (Mexico) proposed that FAO should collect information from all over the world with regard to the handling of fish in small ports, which could then be utilized in the developing countries to avoid errors in this particular field.

Tapiador (Philippines) stated that the Philippines delegation supported the suggestion made from Mexico that FAO should undertake studies on different methods used by Member Countries for fish unloading systems, particularly those that could be applied for small fishing ports and for the developing countries. He further mentioned that in the Philippines, no fishing port existed and the fish was landed from commercial fishing boats about a mile offshore with the use of "amphibious" trucks which brought the catch from the boats to the fish landing point. It would be useful, if engineers could suggest some cheaper alternative system to this method of unloading and transporting fish in places where no fishing port existed.

"Boxing" at sea

Hopper (UK) suggested that boxing fish at sea provided a sound basis for mechanization, stating that the method removed much of the hard work involved in unloading, and that as a result the unloading rate at Aberdeen had increased from about five tons per gang hour to 13 tons per gang hour. He then described the system in further detail. Each box contained fish of uniform quality whereas conventional unloading led to extensive mixing and made quality control systems impossible. The fish remained continuously iced throughout the landing and auction and therefore at about 0°C. Conventionally handled fish might reach 10°C during the auction unless it were re-iced, and was therefore spoiling rapidly at the time of sale. Once the fish were in a uniform container they had a parallel requirement in unloading equipment to frozen blocks of fish and it was not unreasonable to anticipate design of mechanical handling equipment suitable for both cargoes. There was a complete absence of damage with fish boxed at sea whereas in conventional handling up to 5% loss in yield of the bought weight might be expected because of this factor.

In Britain there had been no crew problems and they readily adopted the change. Problems had however arisen in achieving an accurate average weight in each box as only sample weights were taken on landing. There had also been problems with regard to grading by size and species but because of the excessive grading requirements in Aberdeen (five sizes of cod, five sizes of haddock, etc), the results had been as good as could be achieved by conventional methods of unloading and sorting.

Handling and "loss" of boxes

Winninger (Federal Republic of Germany) wanted to know how big was the "loss of boxes" if aluminium boxes were used. Was the fish rehandled after the sale? How far was the box transported inland and how was it transported back? He also asked Hopper's opinion on an aluminium box compared with a non-returnable box in cardboard and how was the cleaning done in aluminium boxes.

Hopper (UK) replying, stated that the boxes were sold without tipping into a second container. Thus, the fish was not rehandled between catching and processing. Since a control system for the losses had been instituted the stock levels had remained the same at each monthly stocktaking check. The expected life of the box was about 12 years and would cost about 1s 6d per cycle of use which included washing and depreciation. This was for a 50 kilo box and it would seem reasonable that this was cheaper than an equivalent capacity non-returnable box in cardboard.

Winninger considered it quite surprising that in Britain they had developed a nearly perfect control of these boxes. He mentioned that the four sea fishing ports in the Federal Republic of Germany had a box pool into which the synthetic material boxes had been put by the different ports. The problem in Germany was that in every control system developed for the boxes there had been leakage and ten thousand boxes had disappeared so that the most important problem in his view was the question of control.

Methods of cleaning

Hopper said that the cleaning of boxes on a large scale had not yet been studied as there were only about 550 in use. The aluminium boxes were soaked in a detergent, followed by a high pressure rinse with cold water and a sterilising agent added. On a large scale this particular process might not be acceptable due to the amount of tankage necessary for soaking.

Recently an abrasive cleaning process had been examined. In this process an abrasive was forced onto the surface of the aluminium under pressure and in the presence of a chemical detergent in atomized spray form. The detergent softened the slime and the abrasive removed it. The initial reaction to this system has been very promising and it would be fairly easy to develop an efficient "on line" cleaning system.

Bruski (Rapporteur) summarizing the discussion, said that he was particularly glad to hear that FAO would take note of the need of the developing countries for information in the field of handling fish in small fishing harbours.

With regard to boxing the catch at sea he said that, in Poland, a box system for cutters had been developed. For pelagic fish it was possible to use small boxes or containers on the ships and once they were filled they had a certain quantity, namely ten kilos in each box. The boxes were then counted and only a sample checking of weight was made. The fish were not sold according to weight but according to the number of boxes. This method, however, was difficult for cod and similar fish. He mentioned that in the German Democratic Republic they used non-returnable boxes and on each box they had the weight checked with a special type of weighing equipment.

SESSION IX

Servicing the Fishing Industry at the Port of Hull, England

by W. Lionel Cox

Services fournis à l'industrie de la pêche au Port de Hull, Angleterre

La fourniture des services que requiert une flotte de pêche constitue une tâche d'envergure, qui peut être menée par des particuliers agissant à titre commercial, par un service relevant des autorités portuaires, ou par l'ensemble des utilisateurs du port groupés en une organisation.

La communication expose les grandes lignes des services qu'assurent pour leur propre compte les armateurs de chalutiers et décrit les organisations chargées de leur mise en oeuvre: la Hull Fishing Vessel Owners Association Ltd, la Hull Steam Trawlers' Mutual Insurance and Protecting Co Ltd, et la Hull Trawlers' Supply Co Ltd.

L'auteur traite notamment des questions suivantes: embauche de main d'oeuvre pour le déchargement de la pêche; fourniture de matériel et d'appareils pour le débarquement; assurance et services médicaux; rôle joué par l'Association des armateurs de chalutiers en matière d'achat du mazout destiné aux navires et l'exploitation d'un magasin où sont vendus aux pêcheurs, à des prix avantageux, tous les articles dont ils ont besoin en mer.

L'auteur ne cite pas de statistiques, car il n'attache guère de valeur aux comparaisons de coûts entre pays.

Le secteur privé est loin de fournir tous les services requis et maintenant que l'industrie de la pêche traverse une crise, il faudra se préoccuper du besoin d'assurer davantage de services sur une base collective.

Prestación de servicios a la industria pesquera en el Puerto de Hull, Inglaterra

La prestación de servicios a una flota pesquera constituye una operación muy importante que puede ser ejecutada por operadores independientes actuando como empresa comercial, por las propias autoridades portuarias como parte de los servicios del puertos, o mediante la actuación colectiva de los usuarios de los muelles por medio de alguna organización establecida.

Este estudio describe esquemáticamente los servicios que se prestan a sí mismos los armadores de arrastreros, y las organizaciones encargadas de tales servicios, The Hull Fishing Vessel Owners' Association Ltd, The Hull Steam Trawlers' Mutual Insurance and Protecting Co Ltd, y la Hull Trawlers' Supply Co Ltd.

Describe el empleo de la mano de obra para el desembarque de los cargamentos de pescado; la facilitación de equipo y elementos para el desambarque; seguros y servicios médicos; el uso de la Asociación como organismo para la adquisición de fuel oil para calderas; y la administración de una tienda en la que se venden a los pescadores a precios económicos todos los materiales que necesitan cuando están en el mar.

En este estudio no se ha tratado de citar estadísticas, ya que se estima que las comparaciones de los costos entre un país y otro no tienen validez.

Los servicios proporcionados por las empresas privadas no son completos y en la actualidad, en que la industria se halla decaída habrá que pensar en la necesidad de facilitar más servicios en forma colectiva.

THE base of the fishing industry at Hull, or to give the River Humber estuary town its correct name, Kingston-upon-Hull, has been at St Andrew's Dock since 1883, and this dock and its extension covers 81,000 m^2 (20 acres) of water space with 913 m (1,000 yd) of fish landing quays equipped for the landing, marketing, filleting, packing and dispatch of fish to all parts of the country.

There is adjacent a special berth which has been constructed for the discharge of freezer trawlers—Hull has 17 such vessels—details of which are discussed in another Conference paper.

Servicing facilities are in the main provided for the trawler companies by a number of organizations owned or controlled, either wholly or partially, by the trawler owners themselves and the greater part of the servicing is carried out by two bodies known as The Hull Fishing Vessel Owners' Association Ltd, and The Hull Steam Trawlers' Mutual Insurance and Protecting Company Ltd, whose offices and staffs are also located on St Andrew's Dock.

This paper deals first with those aspects of servicing which come under the control of the Association and its allied organization, The Hull Fishing Industry Association, but before describing the services those organizations provide, there is a need to explain, at least in outline, the purpose of these organizations and the reasons why they were established, together with a justification for two separate Associations which might appear to be an unnecessary duplication.

Owners' association

The Hull Fishing Vessel Owners' Association Ltd, is a company limited by Guarantee (without a share capital) constituted under the Companies Acts and was formed in 1892 with its main objects *inter alia*:

(a) To consider all questions affecting the interests of the fishing industry or other trades connected therewith
(b) To collect and circulate statistics and other information relating to the trade
(c) To formulate policy on matters affecting conduct on the catching side of the fishing industry at the port
(d) To conduct negotiations with government departments, dock authorities, local authorities, and any other bodies on behalf of its members
(e) To provide labour for the landing of fish cargoes
(f) To purchase on behalf of its members bunker fuel oil, etc.
(g) To operate a fishermen's outfitting store for the benefit of fishermen; and
(h) To provide fishermen's training courses.

It may be asked, when the objects of this Association cover so many aspects, why a second Association is required, with the attendant problem of deciding under which organization various business affairs should be managed. In the objects cited here there is no mention of "labour relations", one of the major objects of an employers' organization, although object (e) refers to the provision of labour.

Scope of the law

Apart from the employment of labour it is a normal function of an employers' association to deal with the relations between workpeople and employers on behalf of its members. A limited company is not, however, the most convenient form of organization in England to deal with matters of labour relations either between employers or between employer and workpeople, though most employers' organizations are registered in this way. The law relating to trade unions is not confined to unions of workpeople, and is available, if desired, for the use of associations of employers. Employers' associations can, therefore, register as trade unions and obtain the full benefit and protection of trade union law. Registering in this way can be most helpful to employers, not only in labour negotiations and activities, but in other restrictive activities in which they may wish to indulge.

In 1953, the wisdom of forming an employers' trade union, as distinct from an employers' association, was fully realized and the trawler owners then established The Hull Fishing Industry Association and registered it under the Trade Union Acts, 1871 to 1927 and the Trades Disputes Act, 1946. It has proved to be a most valuable organization, especially in dealing with restrictive trade practices which might otherwise have contravened the criminal and/or civil law and left the Association open to legal attack and penalty. The trade unions of the workpeople do not look upon the use made by employers of this "workpeople's" legislation with much favour, and recently the Trade Union Congress submitted evidence to the presently sitting Royal Commission on Trade Unions and Employers' Associations suggesting a change in the law in this respect.

The fish dock is owned by the British Transport Docks Board. It passed out of the hands of the London & North Eastern Railway Company when the railways and ports which were owned by the railway companies were nationalized under the Transport Act, 1947. The British Transport Docks Board, known as the "Dock Authority", provides a number of facilities for the functioning and servicing of the port, such as the buildings, quayside, cranes and slipways, to mention a few, and for the use of these facilities, quite naturally, makes certain dock charges. The facilities provided are by no means comprehensive, and a number of essential services have to be provided by the trawler owners themselves, either through the Hull Fishing Vessel Owners' Association or other ancillary organizations.

LANDING LABOUR

At present, the fleet consists of 56 oil fired vessels; 26 diesel vessels; 4 diesel electric vessels; 17 freezer (diesel) trawlers, and 4 seine net boats.

Up to 1967 it was only at the Port of Hull that the trawler owners employed labour through their collective association to discharge vessels, but, due to a change in the law under the Docks and Harbours Act, 1966, other ports have now been obliged to set up labour-employing companies as subsidiaries of their associations. The Hull Fishing Vessel Owners' Association Ltd, established its own "pool" of labour, for the discharge of its members' fish cargoes, in 1946, and all vessels, whether they are local, from other British ports, or foreign, can only be discharged by landing labour engaged through the Association. Foreign vessels, to obtain this labour, require an agent who must be a member-company of the Association. The Association is comprised only of trawler owners carrying on business from St Andrew's Dock. The labour costs of discharging trawlers are lower because a scheme of labour operated privately and collectively as part of an organization carrying out many other servicing functions is less expensive to administer, as it has not the same high overhead costs which a separate body or individual company would have to bear.

When dock labour was decasualized under the Essential Work (Dock Labour) Orders 1943 to 1945, and later by the Dock Workers (Regulation of Employment) Act, 1946, it was no longer possible for stevedoring companies to engage, on the dock-side, casual labour on a daily basis. The National Dock Labour Corporation Ltd, was set up under the former Orders and its main function was to secure the maintenance of port transport workers. Registers of workers were compiled and all labour required by the stevedoring companies had to be obtained from the Corporation who were responsible for the payment of earnings.

The trawler owners were quick to see the advantages of having an independent Scheme and the Association applied to the Ministry of Labour (now the Department of Employment and Productivity) for exemption from the Order, and were permitted to establish their own Scheme, provided the same principles applying to the Corporation were followed. Having satisfied the Ministry, the Scheme for the Registration of Labour Landing Fish Cargoes was established in 1947. This was a well conceived move as controlling the deployment of labour and its cost has proved to be a highly beneficial service. The labour cost for landing a kit of fish 63.4 kg (10 st), extracted from the audited accounts of the Association in 1967, may be of interest:

	1966/67	1965/66
Costs per kit	Pence (= U.S. cents)	
Landing labour	43.3	42.3
Holiday pay, etc, and National Insurance	4.9	5.1
Guaranteed minimum wage	2.2	2.2
Bobbers' (labour) pension fund contributions	0.8	0.9
Bobbers' (labour) shelter and canteen expenses	0.3	0.3
Administration expenses, audit and amounts written off assets	0.8	0.7
	52.3	51.5

SUPPLY OF BUNKER FUEL OIL

Another service performed by the Association has been the purchase in bulk of the fuel oil requirements for the trawlers. Coal ceased to be used in July 1962, being superseded by bunker fuel oil, and later also by diesel oil.

Negotiations are conducted by the Association from time to time with leading fuel oil suppliers, and contracts entered into on behalf of all trawler owners, to cover their entire requirements. The Association established its fuel oil agency in 1953. It has brought much monetary benefit to trawler owners. The industry's bunker fuel oil requirements have been as high as 350,000 tons per annum but with the gradual change-over from steam to diesel engines and the contraction of the fleet it has fallen to approximately 280,000 tons in 1968.

The collective tonnage purchased on behalf of trawler owners of bunker fuel oil, diesel and gas oil, is such as to cause the major bunker fuel oil suppliers to be more competitive between themselves in order to secure what is, to them, a very large local account.

This buying agency on behalf of the Owners has enabled member trawling companies to enjoy favourable terms for many years. This may not be a port service in the true sense, as it is a private facility for members of an Association, but it is nonetheless a service for the dock operators which would not otherwise be available if common organization had not been practised within the Port.

Consideration was given many years ago to the construction of a port oil storage installation. There were many obstacles to such a project as the large quantity of different types of fuel oil required to service all the vessels made it impossible to find a suitable site. The replenishment of the storage installation would have also been a problem, even if a site could have been found, because tankers of sufficient size and capacity cannot enter the dock, and oil would have had to be piped over or under the quay to an installation. It was because this project was not practical that thought was given by the Association to an alternative idea of building and operating their own lighters. Small boats, such as seine netters, could, of course, be catered for by a shore installation—as they are at Grimsby—but as Hull has only four such vessels, no attempt by the Association has been made to set up a collective fuel oil supply depot. There is, however, an independently owned depot which does provide a bunkering service for the seine net boats or any other small river craft. It is conveniently situated on the River Humber side of the quay and provided there is sufficient water in the river, bunkering of these small craft can be effectively carried out almost any time. It is impossible for trawlers to bunker at this point because the installation can only store a small quantity of fuel oil, insufficient for even one trawler daily.

Hull, however, is not badly placed for the supply of fuel oil, with large storage facilities at Saltend, 7 miles away by river from the Fish Dock, and there are also installations on the other side of the River Humber at Killingholme and Immingham in Lincolnshire. In the last few months a new fuel oil refinery has been built at Immingham, and another is under construction and will be in production within a year. The siting of these two refineries so near the Ports of Hull and Grimsby will undoubtedly bring further economies in fuel costs in future to both ports due to reduction in producers' transportation costs. This will enable them to be more competitive in price.

GEAR FOR FISHERMEN

Another service created by the Association especially for the fishermen produces no direct financial gain to trawler owners and that is the operation of a fishermen's outfitting store. This store, like the Labour Scheme, had to have Government approval before it could be established. This was done in 1927 with the sole object of providing gear of every description for the fishermen's needs at sea at the lowest possible price. Prior to its establishment, fishermen had to buy their gear at various shops off the dock at shop or retail prices and had the inconvenience of getting that gear to the trawler, for which they had to pay a carrier. The fishermen's outfitting store was, therefore, a real service to fishermen and has saved them a lot of money, and at the same time, has been a great convenience to owners in shipping of crews.

MARINE INSURANCE AND SAFETY AT SEA

The Hull Steam Trawlers' Mutual Insurance and Protecting Co Ltd, is another company providing useful facilities for owners. The function of this company, formed in 1907, is primarily to provide marine insurance for trawler-owning companies operating out of Hull. It was trawler owner inspired and is trawler owner managed and financed. Being a mutual insurance company, the cost of all accidents and disasters must, in the long run, be borne by trawler owners themselves and there is a strong incentive, therefore, on the part of all concerned, to avoid unnecessary risks and promote safety conditions for crews and vessels.

Regulations are made by this company to increase safety of life at sea through the training of officers and crews.

TUG FACILITIES AND COMPASS ADJUSTING

In the interests of co-ordination, the Insurance Company also owns and operates a tug fleet of four Voith Schneider tugs which assist the movement of trawlers in the St Andrew's Dock. In addition, a compass adjusting department, a chart producing office and medical services are provided by this company.

MEDICAL SERVICES

Early in this century when Hull trawlers began to fish further afield than the North Sea fishing grounds, men of foresight realized that services to keep pace with the greater distances covered were required, and so in 1906, a part-time medical service was instituted.This covered only a very small part of real needs but it was one of the very first industrial medical services in Great Britain. Trawlers developed with improvements in technology and science but it was not until 1930 that a fully comprehensive service was set up.

A full time medical advisor was appointed with necessary staff. Very good premises were designed and built on their advice, and the health and physical condition of all boys and men going to sea was recorded and a regular check kept on their well-being. Hospitals in proximity to all new fishing grounds round Scotland, Faroe, Iceland, Norway and Bear Island were reviewed, and a medical guide was written to give all skippers advice on suitable places to seek medical aid. This guide also gives instructions in the diagnosis of illness, and simple first-aid. Courses of instruction for all prospective skippers and mates on medical matters are organized, and all skippers and mates must now possess an authorized Certificate of Competency.

The supply of medical equipment for all trawlers was taken over by the medical service, all needs were considered, and such equipment as is within the scope of trained personnel is provided on each vessel, and is constantly kept in line with new techniques and ideas. In 1932 the scope of work of the medical service had so expanded and the range of trawlers had so greatly increased, that entirely new premises were designed and built. These were undoubtedly amongst the best-equipped in Great Britain and included a comfortable waiting room, dispensary, consulting room, records filing room, minor operating theatre and complete X-ray plant and processing equipment.

The medical service is constantly in touch with agents at all ports outside Hull, and with skippers, by link radio calls, concerning any medical attention or advice required. The service also includes excellent casualty facilities for all dock workers and for all fishermen coming back from the distant fishing waters. The surgery is immediately alongside the dock entrance, and urgent attention is available at any time of the day or night by arrangement with trawler skippers concerned.

This work is done with the maximum of enthusiasm and ability and with much knowledge of the problems which are always changing with new techniques in distant deep sea trawling.

EQUIPMENT

For many years a substantial part of the landing equipment needed for the discharge of trawlers was provided by the Association. This equipment, like labour, was hired out to members as required and as appliances and labour were needed together, it was clear that this service also played an important part in the economics of operating a trawler fleet. This service has now been transferred to an ancillary company, as were other similar services in recent years, as it was considered best to have all this type of service performed by one company specially organized for the purpose. This could be described as a tidying up process, and an improvement in efficiency by having only one organization for the supply of landing services rather than two.

It would be a costly undertaking for each independent trawler firm to purchase and operate its own equipment, such as electric landing winches, pumps, baskets, ropes, gangways, deck-lighting, etc., and especially so for a small company with few trawlers needing the use of such costly equipment, and with possibly only one trawler to discharge each week. The same principle applies to the engagement of labour. The "pool" system is applicable to the supply of labour and in effect also applies to landing equipment and appliances in that it is hired by members as required from an ancillary company known as The Hull Trawler Supply Co Ltd. This Company now provides all the landing gear required for the discharge of fishing vessels, both for wet and frozen fish. In 1968, the present system of discharging trawlers by means of an electric winch with ropes and "gin wheels" attached to the vessels, from which fish baskets full of fish and ice are swung from ship to shore, may sound archaic, especially if viewed in the light of other more modern means used in some other countries such as suction pumps placed in the fishroom. But even so, this old system has proved over many years to be an acceptable and effective system, and viewed in conjunction with the landing "labour pool", the combined cost of this service to owners is still the lowest in comparison with any other port in the United Kingdom.

It does not mean, however, that because it is the cheapest way to land fish thought has not been given to other modern means of discharging, and a few years ago consideration was given to mechanical handling. Plans were prepared for full mechanical handling equipment—from fishroom to market floor—but the high cost of the machinery required, and the structural deficiencies of the market floor upon which it would have to rest, ruled out any development in this direction. There was, however, a pilot scheme a few years ago at Grimsby, sponsored by the White Fish Authority, for the discharge to take place by partial mechanical means which did not prove to be a practical success or a commercial proposition. Up to now, no suction pump system has been introduced capable of landing the large fish caught by the distant water vessels but a recent experiment, undertaken in Newfoundland, with this type of equipment, has, it is claimed, proved capable of picking up the larger fish and in the near future Hull Owners must consider this method in all its aspects for the possible use on the Hull market.

It is not necessarily true that mechanical handling must be the best means of performing a job usually undertaken by manual labour. The fish kits (the containers into which fish is landed and laid-out on the market for sale) were, up to October, 1950, washed by hand by a team of workmen known as "kit scrubbers". Anything up to 15,000 kits were washed nightly by hand with cold water and small hand brushes, until in 1950 special mechanical washing machines were installed. The kits passed through the machines which sprayed hot and cold water onto them. The machinery was scrapped in 1965, as the fish slime adhered to the kits and could not be sufficiently removed by the jet system, and there was a reversion to hand labour, which is still the method used today. Fortunately, the cost of installing and later dismantling the plant was, because of the co-operative system, borne by all the users at a lower cost than would have fallen upon an independent operator.

Another instance where manual labour is still being used in spite of machinery having been invented to do the job is the washing of fish pound boards. The machines for this purpose got no further than the prototype, and today all the boards used on the trawlers, whether wood or aluminium, are washed by hand. This does not mean that machinery would not be better to do this most laborious job, but efficient and economical machinery has yet to be produced. In the meantime manual labour using cold water and scrubbing brushes will continue to do the "kit-washing" and "board-scrubbing" work on a more economical basis than machinery.

WATER BOAT SERVICE

The services provided by the Hull Trawler Supply Co Ltd, do not end with hiring out to its members the equipment for the discharging of trawlers or the washing of kits. This Company also owns and operates a fleet of four water-boats for the supply to trawlers of fresh drinking water. It can be well imagined that the operation of these boats over many years has been a wise and economical move on the part of the trawler owners at the Port. The water boats draw the fresh water from the Corporation at a discharge point on the dock and supply it to trawlers as required. Trawlers can also be supplied direct from a shore water hydrant but it is not always convenient for trawlers to berth at this point and an alternative source of supply had to be provided.

OTHER ANCILLARY COMPANIES

Other servicing companies in which trawler owners have an interest include ship-repairing, the operation of mobile cranes and the manufacture of ice.

At the Port of Hull many of the facilities needed to operate trawlers are provided by the operators themselves on a collective basis. This raises the question of what other facilities are provided by the dock authority for its tenants. The Dock Authority, as previously explained, is the British Transport Docks Board. It might be thought that a nationalized industry should provide all the major facilities needed by a user. The Dock Authority, however, does not take that view since it is required to show a profit.

Therefore, to achieve that profit, the charges and dues levied must be sufficient to cover depreciation. New projects must consequently be properly financed in the same way as any other commercial transaction. It has been known for the Dock Authority to propose leasing their land, the users to be responsible for the financing and maintenance of the undertaking themselves. This was proposed when the re-construction of the slipways at a cost of one million pounds ($2,400,000) was under consideration but no agreement was reached. The present slipways are now obsolescent as only a very few vessels are able to use them. This means that most vessels requiring repairs or surveys need to move out of the fish dock to the commercial docks, where dry-docks are available. This quite naturally adds to the cost of the job because tug service and additional labour is required. It has been argued that slipways are a necessary facility, to be provided by a Dock Authority for the convenience of shipowners.

PRIVATE PORT SERVICING AND THE PORT AUTHORITY

There remains the question of what other private facilities or services might have been provided. The trawler owners have provided their own tugs and water boats and consideration has been given to the building and operation of oil carrying lighters. The cost of delivery of fuel oil by lighter adds considerably to the base price of bunker fuel oil. The present service is performed by independent lighter operators under contract to the fuel oil suppliers. It is an efficient service and in recent times a more economic use of the lighters has been achieved by the central ordering of fuel oil requirements on behalf of all companies through the Association. Much greater economies could, however, have been achieved by the Owners if they themselves had built and operated their own lighters either through the Association or an ancillary company. —such as The Hull Trawlers' Supply Company Ltd. Costings for the operation were, in fact, carried out, and the estimates showed that savings up to £50,000 ($120,000) per annum could have been achieved. There are other commodities used in the fishing industry which could be bought or used on a collective basis and thought will have to be given in the future to the introduction of new services in order to effect savings, particularly in view of the present economic depression through which the industry is now passing.

The system of collectivism, as practised by the Association and its ancillary companies, described in this paper, is considered to be a worthwhile contribution to the economics of servicing the industry. The object of this paper has been to describe the services which are provided privately by the port users themselves at the Port of Hull. Ways of improving the economy of the local industry have been illustrated and it is hoped that this form of organization may be of interest to others.

New Slipways and Boatyards in the Port of Esbjerg

by B. O. Juhl

Esbjaerg: Le nouveau slipway du bassin 5

Le nouveau slipway du port de pêche d'Esbjaerg comporte 4 chariots pouvant recevoir des navires de 125, 250, 500 et 750 tonneaux de jauge nette, respectivement. Le garage du chariot de 125 tonneaux permet la mise au sec de 34 navires de pêche, disposés de manière à pouvoir être remis à l'eau individuellement sans déranger les autres. Si d'importants travaux sont nécessaires, les bateaux peuvent être amenés dans les ateliers de réparation. L'installation appartient aux autorités portuaires, qui en assurent la gestion et s'occupent du hissage et de la descente, tandis que réparations et entretien sont effectués par des entreprises privées ayant pris en location l'emplacement de travail. Il faut environ une heure pour un halage et une remise à l'eau. Un séjour normal en slipway (1½ semaines) coûte environ KRD 380 ($E.-U. 50) pour un navire de pêche de 50 tjb. A l'entrée, un rideau de bulles protège le slipway contre la pollution de surface des eaux du bassin.

Nuevos varaderos y astilleros en el Puerto de Esbjerg
Varadero de la darsena 5

El puerto pesquero de Esbjerg dispone de cuatro varaderos que pueden recibir embarcaciones de 125, 250, 500 y 750 toneladas de peso neto, respectivamente. En conexión con el varadero para embarcaciones de 125 toneladas existe un sector que puede albergar 34 barcos pesqueros, situado cada uno de ellos de tal manera que se puede lanzar al agua sin molestar a los demás. En el caso de que sea necesario realizar en los barcos reparaciones de importancia se pueden llevar también a los cobertizos de los astilleros. Los varaderos pertenecen al puerto, que se encarga de sacar del agua las embarcaciones y de su lanzamiento, en tanto que los trabajos de reparación y mantenimiento de los barcos los realizan empresas privadas que han alquilado la zona adyacente. El sacado del agua y el lanzamiento se pueden realizar en una hora aproximadamente. El uso de un varadero durante una estancia normal de una semana o semana y media cuesta unas 380 coronas danesas (50 dólares) por embarcación pesquera de 50 toneladas de registro bruto. Dentro del umbral se coloca una falsa cortina para evitar que la superficie contaminada de la dársena ensucie el varadero.

IN connection with an extension of the Esbjerg fishing port during the years 1960 to 1964, at which time the port was extended from four to five basins and changed so that it had two entrances, one to the harbour for consumers' fish (basins one, two and three) and one to the basins for industrial fish and the slipway area (basins four and five) a new slipway plant was built on a reclaimed area north of the new basin.

This new plant replaced an existing plant built in 1930 to 1932. The old plant, which was placed in a former fishing harbour in the middle of the traffic port area could only accommodate 24 fishing vessels of a maximum net weight of 80 tons. This capacity had gradually become too small and the design of the plant was old-fashioned. Moreover the removal was part of the rationalization of the port, according to which all facilities for fishing vessels were to be centred around the fishing port.

SLIPWAY CAPACITIES

The new plant has four ways to which access is obtained from basin five of the fishing port, see table 1.

All the engines are powered by 380 Volts DC and the engine shaft runs 800 revolutions per minute. The power transmission between engine and drum is affected by gears, and all drums have a diameter of 1,300 mm (51 ins).

TABLE 1. TECHNICAL DETAILS OF THE FOUR WAYS OF ACCESS

Way No:	1	2	3	4
Maximum net weight of vessel in tons	125	250	500	750
Gradient of way	1:15	1:18	1:18	1:18
Engine Power (hp)	45	35	45	65
Drum speeds:				
Low gear (rpm)	2.20	2.20	0.85	1.27
High gear (rpm)	4.63	4.63	1.94	2.90
Number of wire parts	1	3	4	6
Platforms:				
Length (m)	16.8/21.8	29.5	45.3	57.3
Width (m)	4.5	6.0	8.3	9.3
Depth at front of platform (m)	3.7/3.5	4.5	3.5	3.0

Slipways Nos 2, 3 and 4 are intended for big fishing vessels, coasters, small ferries, the dredgers of the port, etc. The platforms of these slipways are flat and a special support is built up for each vessel to be admitted.

Method of operation

Slipway No 1 with a capacity of 125 tons net weight is essentially intended for fishing vessels. In connection with this slipway there is a stand area for 34 vessels. Each stand is provided with a stand platform on which the vessel remains during its entire stay on the slip. The cradle has a horizontal top provided with rails on which the stand platform can run. When a vessel is to be taken ashore the empty stand platform rests on the cradle in its

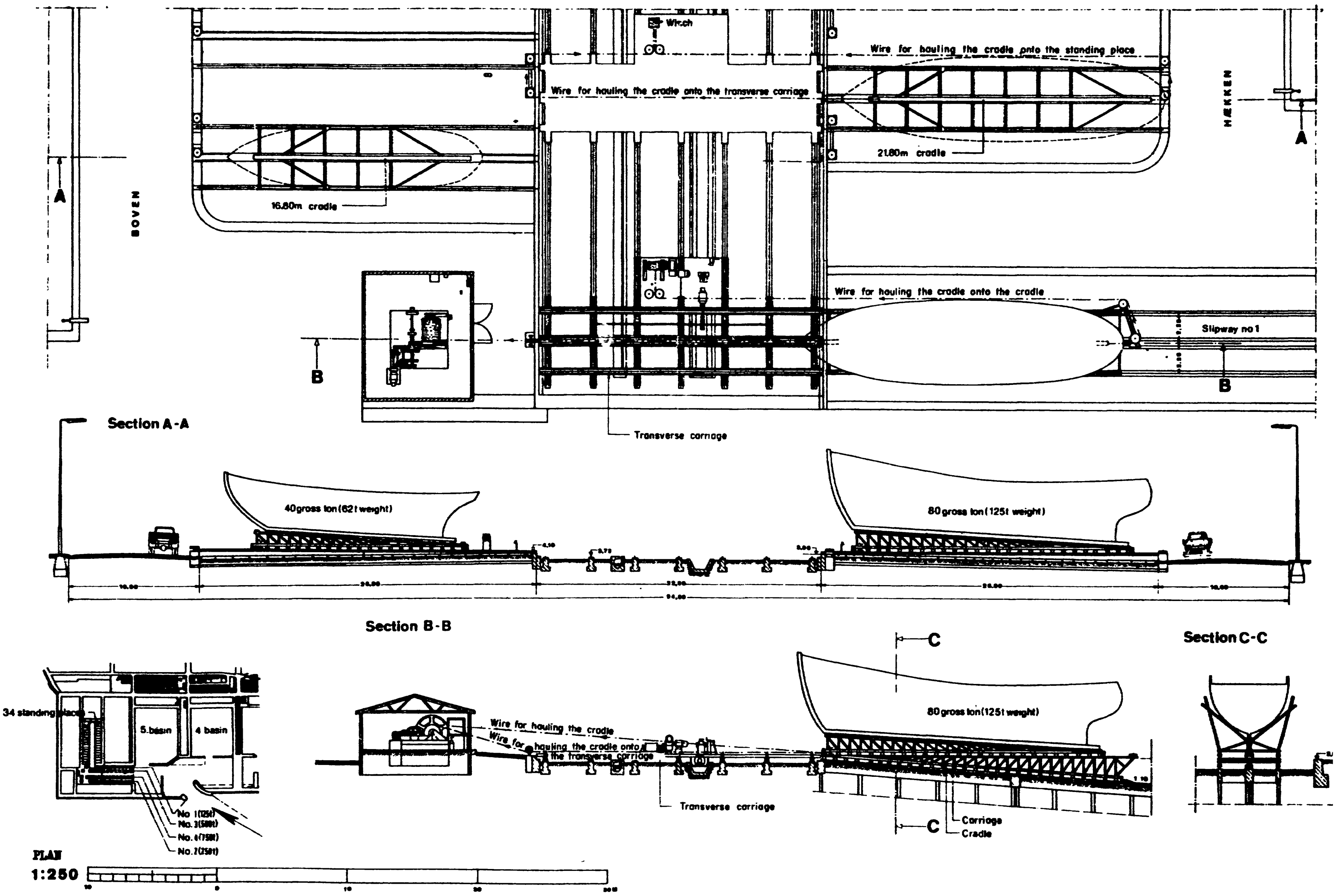
Winch
Wire for hauling the cradle onto the standing place
Wire for hauling the cradle onto the transverse carriage
HÆKKEN
A
21.80m cradle
16.80m cradle
BOVEN
Wire for hauling the cradle onto the cradle
Slipway no 1
B
Transverse carriage
Section A-A
40gross ton (62t weight)
80gross ton (125t weight)
Section B-B
C
Section C-C
34 standing place
5.basin
4 basin
No 1(125t)
No. 3(500t)
No. 4(750t)
No. 2(250t)
Wire for hauling the cradle
Wire for hauling the cradle onto the transverse carriage
Transverse carriage
Carriage
Cradle
PLAN
1:250

Fig 1. General arrangement of the slipway and boatyard at the Port of Esbjerg

bottom position. The vessel is standing on its keel on stocks at each 0.80 m (26 ins) and is supported at the sides by adjustable arms (see Section C-C of fig 1). The cradle is hauled by a stationary electric winch to its top position (see Section B-B) when the stand platform can be hauled from the cradle onto a travelling platform.

On the travelling platform the stand platform is moved sideways until it is level with an empty stand when vessel and stand platform are hauled on to the empty stand by means of an electric winch on the travelling platform. The vessel remains on the stand platform until it is once more to be launched.

There are two sizes of stand platforms, the lengths of which are 16.8 (55 ft) and 21.8 m (72 ft) respectively but the shorter platforms are made so that they can easily be extended should the development of the size of vessels make this necessary. The vessels are normally standing outdoors, but if they are required under cover for major repairs, temporary rails can be placed across the access roads (Haekken and Boven) from the stands to the construction sheds of the shipyards on the adjoining areas so that the vessels can be taken into these sheds.

The slipway can also be used for the launching of new vessels constructed in the construction sheds. A special two-piece platform carriage is run in under the new vessel, which is chocked up on the special carriage and then launched in the usual way.

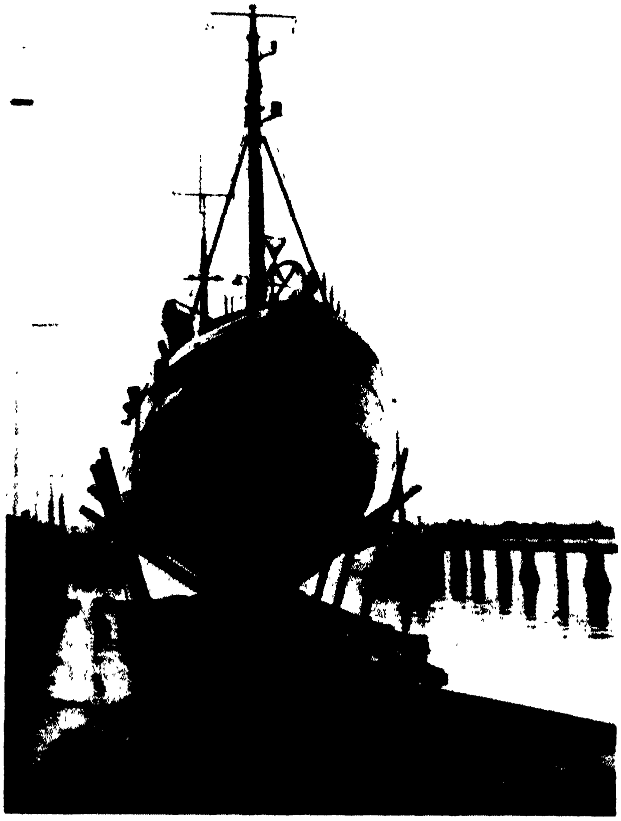

Fig 2. Vessel on the carriage and cradle being hauled up the slipway at Esbjerg

FLEXIBILITY OF THE SYSTEM

Unlike other Danish fishing harbours, the vessels of the fishing fleet of Esbjerg do not differ much in size. The majority of the vessels are of a tonnage of between 40 and 55 gross registered tons (corresponding to about 60 to 85 tons net weight), and only very few are of 80 gross registered tons or more (corresponding to about 125 tons net weight). Slipway No 1 which is designed for a maximum load of 125 tons and which is essentially intended to be used for fishing vessels, can receive practically all the fishing vessels from Esbjerg. The few vessels of more than 80 gross registered tons (125 tons net weight) can be admitted on Slipway No 2. This slipway, which can only accommodate one vessel at a time, can at present serve these vessels, but if a vessel tonnage of more than 80 gross registered tons should become more general in Esbjerg, a sideways hauling arrangement similar to the one described for Slipway No 1 can be constructed in connection with Slipway No 2.

Fig 3. Hauling a vessel from the slipway carriage to the transverse carriage

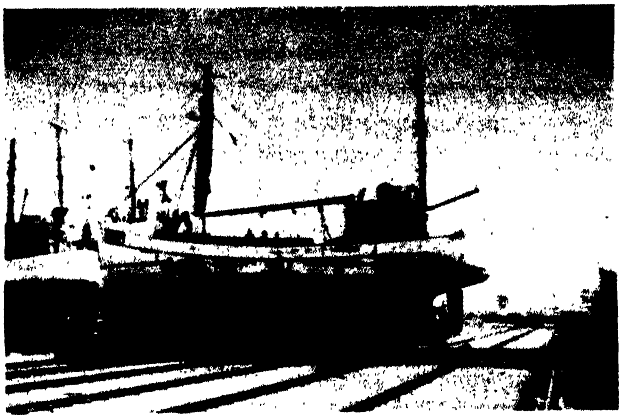

Fig 4. Vessel on the transverse carriage

The majority of the Esbjerg fishing vessels are made of wood and require two visits to the slipway per year. At the moment about 1,100 vessels are taken ashore each year, which gives an average stand time of about 1.4 weeks per boat and approximately five admissions and launchings per day. However, the plant is not evenly occupied all through the year, the busiest time being the summer months when it is easiest to get the woodwork dry so that it can be painted. Therefore, the plant has been designed so that the launching of a finished vessel and the admission of a waiting vessel can be completed in an hour thus making it possible during peak periods to replace eight vessels on the slipway in an ordinary working day.

OWNERSHIP AND MANAGEMENT

The slipway plant was constructed and is managed by the Port of Esbjerg Authority, which is a Government institution. A slipway master is in charge of the operation of the slipway, and he is assisted by five men. When a vessel is to go on the slip the owner must himself have it taken to the slipway where it is taken over by the slipway staff, who see to the supporting of the vessel on the stand platform and to the hauling and conveying to the stand.

Repair and maintenance work on vessels is carried out by private firms, in particular shipyards that also build new fishing vessels and have workshops around the slipway area. The supply of water and electricity for repair and maintenance work is, however, the responsibility of the port, electricity plugs and water taps being placed at the stands. Electricity consumption is measured by centrally placed meters, whereas water consumption is measured by water meters at each stand. Day-to-day cleaning is carried out by the slipway staff but it is the duty of vessel owners to remove large amounts of refuse left over from the repairs.

CHARGES

For hauling out, conveying to and from the stand, and re-launching a fishing vessel the basic fee is D.kr.100 ($13) plus D.kr.5 ($0.65) per gross registered ton for the first 100 gross registered tons and D.kr.2.50 per ton thereafter, i.e. about D.kr.350 ($45) for a normal Esbjerg vessel of about 50 gross registered tons. To this should be added D.kr.2 ($0.26) per day for occupation of stands for the first five days, D.kr.5 ($0.65) per day for the following five days, D.kr.10 ($1.30) per day for the next ten days and D.kr.20 ($2.6) per subsequent day, i.e. a total of about D.kr.380 ($50) for a 50-ton vessel remaining on the slipway for one and one half weeks.

Large vessels on the slipways pay D.kr.0.25 ($0.03) per gross registered ton per day; there is, however, a minimum of D.kr.15 ($2).

The cost of construction for the entire plant, comprising slipways, quay walls, stands, winches, etc. amounted to a total of D.kr.6.6 million ($830,000) (1964). The slipway charges are calculated so that their total sum plus rents from the shipyards on the adjoining areas can cover the working expenses including interest and depreciation of the initial cost.

PROTECTION FROM SURFACE POLLUTION

Basin five of the fishing port, at which the slipway plant is situated, is also partly used as a discharge basin for industrial fish, and herring oil may at times—especially in summer—float around on the surface of this basin. To prevent this oil from floating into the mouth of the slipway, where it would be a nuisance to the work of supporting vessels before hauling, a bubble curtain has been put across immediately inside the threshold. This consists of a 70 mm (2.7 in) plastic tube which is provided with 1.25 mm (.05 in) diameter holes every 30 cm (11.8 in) through which compressed air is blown. The tube is placed at 6.8 m (22.4 ft) water depth, and the compressor has a yield of four cubic metres (141 cu ft) of air at a pressure of 2.5 atmospheres. When the air bubbles rise they cause a water rise at the water surface of 10 to 15 cm (4 to 6 ins). The water rise causes a current away from the bubble curtain, and this current prevents surface pollution from entering the slipway mouth. The bubble curtain is started only when the wind forces surface pollution towards the slipway mouth.

Repair Problems of the Industrial Fishing Fleet in Designing Fishing Harbours

by A. Korniak

Les problèmes que posent les réparations des navires de pêche industrielle et leur influence sur la conception des ports de pêche

Le grand essor de la flotte de pêche polonaise et le développement de ses ports de pêche ont soulevé maints problèmes concernant l'organisation des installations de réparation des navires. L'auteur étudie les besoins en matière d'entretien des différentes catégories de bateaux et leur incidence sur l'organisation des installations portuaires. Ces besoins sont examinés, pour les divers types de navires, en fonction des différents genres de travaux de réparation et d'entretien.

L'auteur s'attache surtout aux chalutiers de taille moyenne, car les besoins des petits bateaux de pêche en bois sont bien connus, tandis que les très grands navires-mères et navires-bases posent des problèmes particuliers. Il passe en revue les "états de service" de plusieurs chalutiers de taille moyenne en tenant compte des caractéristiques du bâtiment, du mode de construction, des matériaux employés, etc. On constate que les navires à moteur passent moins de temps au chantier pour les réparations à la salle des machines que les navires à vapeur, et qu'il existe des différences notables en matière de réparations à l'installation électrique. L'auteur étudie le système de l'échange standard des moteurs étendu à l'entretion courant, qui se révèle plus expéditif et plus facile pour les chalutiers conserveurs que pour les chalutiers de pêche fraiche.

L'auteur décrit le type de matériel et d'installations portuaires nécessaires, en soulignant l'importance des élévateurs "syncrolift", et examine les facteurs limitatifs intervenant pour diverses catégories de navires.

Problemas de reparación de la flota pesquera industrial al diseñar los puertos pesqueros

El gran desarrollo de la flota pesquera polaca y la ampliación de sus puertos pesqueros ha planteado muchos problemas con respecto al proyecto de las instalaciones y servicios para la reparación de los barcos. En este trabajo el autor examina las necesidades de mantenimiento de las diferentes clases de embarcaciones y sus consequencias respecto al diseño de las instalaciones y servicios portuarios. Se exponen las clases de embarcaciones de la flota y se explican sus necesidades en términos de las diferentes clases de reparación y mantenimiento.

La información detallada se refiere especialmente a los arrastreros de tamaño medio ya que se conocen bien las necesidades de las pequeñas embarcaciones pesqueras de madera. Los grandes buques-nodriza y los buques-base plantean problemas especiales. Se examinó la historia del servicio de algunos arrastreros de tamaño medio teniendo en cuenta las características de la embarcación, su construcción y material, etc. Se ha observado que la reparación de los salas de máquinas de los barcos con motor exige menos tiempo que las de los barcos a vapor; existen diferencias importantes en las necesidades de reparación eléctricas. Se examina el sistema de mantenimiento mediante la sustitución de los motores, viéndose que es más rápido y fácil efectuarlo en los arrastreros que elaboran el pescado que en los que se limitan a pescar.

Se explican las clases de equipo y las instalaciones de los muelles, mencionándose especialmente la importancia del "syncrolift" (elevador automático). Se examinan las dificultades concernientes a varios tipos de barcos.

ONE of the essential tasks of the sea port is to provide repair services. As these services for the ships, the largest floating structures, are most complicated and need special facilities, the areas for their performance must be specially planned.

Compared with the total area of the port, the ship-repairing yards are only a small part, but nevertheless, as their construction is very costly, the planning and design of such installations must be considered very thoroughly.

Installations, such as docks, wharves, power installations, machines, etc., make the cost of building, the shipyard higher than other parts of the port. On the other hand, the port cannot perform its duties if there is none or insufficient repair facilities. It must therefore be stated that the ship should have in the port, the full facilities for overhaul and repair. As the facilities needed for this purpose are very costly, the repair requirements of the fleet must be examined very thoroughly.

SHIP REPAIR SERVICE

To perform its task the fishing vessel must be seaworthy, and all its fishing, processing and refrigeration installations must be efficient and in good condition.

Need for repairs may arise from:

(a) normal wear and tear
(b) wrong operating and maintenance procedures
(c) poor materials used on construction
(d) poor fuel and lubrication
(e) damage by Acts of God

Repairs must be dealt with in a specialized enterprise. Maintenance and precautionary measures by the shipowner and the crew can minimize repair needs, but the rules of the classification societies, and normal wear, will always call for high quality work.

To define repair requirements of industrial fishing vessels is difficult, as they are comparatively new types of ship and their period of service is rather short. Up till now these requirements are small but it is to be expected that they will grow rapidly with time. Investigations in Poland showed that their service index is 77 per cent, that is, 23 per cent of their working time was used for repairs. For the group of old non-industrialized fishing trawlers the same index was only 74.3 per cent. The service index reached by the industrial fishing vessels can thus be considered good. It is intended to maintain it at the same level, through all the periods of service.

CLASSIFICATION OF REPAIR GROUPS

From the repair point of view, the ship can be divided in the following repair groups:

Hull. (a) Dock repairs, (b) Carpentry, (c) Painting, (d) Rigging.

Machinery. (a) Engines, (b) Pipelines, (c) Boilers and tanks, (d) Installations and electrical equipment, (e) Measuring equipment.

Specialized installations. (a) Fishing gear, (b) Navigation and search equipment, (c) Processing plants, (d) Cooling installations, (e) Transport installations.

For the hull group the main data are dimensions of the hull, its weight and the hull material.

Fishing vessels built and operated in Poland fall into the following groups.

Group 1. Small sea fishing vessels—cutters, supercutters, luggers, coastal trawlers and seiners, of the following sizes:

(a) Length:	from 17 m up to 35 m (56 to 115.5 ft)
(b) Breadth:	from 5 m up to 7 m (16.5 to 23 ft)
(c) Draught:	from 1.8 m up to 4 m (6 to 13 ft)
(d) Tonnage:	from 65 tons up to 350 tons.

Group 2. Middle-size sea fishing vessels—side trawlers, stern trawlers, tuna vessels, freezing trawlers and processing trawlers of the following sizes:

(a) Length:	from 45 m up to 90 m (148.5 to 297 ft)
(b) Breadth:	from 8 m up to 15 m (26 to 49.5 ft)
(c) Draught:	from 4 m up to 5.5 m (13 to 18 ft)
(d) Tonnage:	from 500 tons up to 3,000 tons.

Group 3. Large sea fishing vessels—mother ships and bases:

(a) Length:	over 120 m (396 ft)
(b) Breadth:	over 16 m (53 ft)
(c) Draught:	over 7 m (23 ft)
(d) Tonnage:	9,000 tons

In this classification, research ships and hospital ships are not included, as their number is very small and also transport ships, whose construction is similar to merchant ships and therefore have no special repair problems.

Wood, for building small fishing vessels, is used on older units and its use is decreasing. Carpentry shops should be changed in future into shops dealing with the actual materials in use for hull construction. Steel is in general use for hulls and experiments with other materials are in the early stages. The problems of hull maintenance and repairs of fishing vessels are very similar to those of merchant ships. Glass-polyester laminates are new materials for hulls, and continuous experiments allow us to suppose that this material will replace steel in future. So far it does not pose a problem for the repair services but in programming ship-repair yards it should be borne in mind.

In machinery, the tendency is to greater power with increased weight of internal combustion engines. The installed power index per running metre of the hull is as follows:

(a) fishing vessels/catchers/up to 25 hp per m (3.3 ft)
(b) fishing and processing vessels, 30 to 50 hp per m (3.3 ft)
(c) mother ships and bases over 55 hp per m (3.3 ft)

With increased main propulsion power auxiliary power is increasing too. From the repair point of view it influences not only the engine shop but the electric shop as well and the consequences are seen in the ship repair yards.

In the specialized fishing equipment group special attention must be paid to the same types of fishing vessels —processing trawlers, mother ships and bases. Traditional fishing gear and equipment repairs do not present any serious problems in shipyard planning. The equipment of both above-mentioned groups of fishing vessels qualifies to be called **aggregate repair,** i.e., a whole system of machines is replaced by a spare set, and the removed set is repaired separately from the ship and installed in some other ship. It is not always possible to organize such a system for some components and as a rule it needs the establishment of such repairs policy in the whole national fleet. Of course it is not possible to solve the problem while designing one shipyard. It is to be stressed here, however, that the repair of the processing plants can include the land installations of the fish industry and therefore before planning the shipyard this factor must be analysed very thoroughly.

REPAIRS OF THE INDUSTRIAL FISHING FLEET

These divide into two fundamental groups: (a) planned repairs; and (b) non-planned repairs.

All repairs connected with ship classification include: (a) class repairs, (b) annual survey repairs, (c) last repair before scrapping.

The last repair includes the work necessary to get a temporary navigation certificate for the ship before putting it out of service.

Non-planned repairs include intervoyage repairs, docking painting, damage repairs and reconditioning the ships. The scope of the repairs divides them into two groups according to whether they are above or below the water line. Defining the groups of repairs for the vessels registered in a given harbour is very essential for the planning of repair facilities. Attention must be paid not only to determine the proper outfit of machine tools but also for the ground and water surface.

METHODS OF DEFINING REPAIR REQUIREMENTS

Investigations made by Projmors (Consulting Engineers for the Ministry of Shipping) in 1965–67 covered the repairs of the second group of ships—middle-size ships, as the needs of the small fishing vessels are comparatively well known—and this group does not show much change in design or number. The third group of ships, as a special problem, is not dealt with in this paper.

The above investigations were considered necessary as the amount of work for repairs in this group varied considerably. The investigations covered two series of ships built in Poland to obtain data for comparison. The first series were traditional side trawlers, steam driven, as follows:

> Overall length: 59.23 m (195 ft); Length between perpendiculars: 53.86 m (187 ft); Beam: 9.0 m (30 ft); Draught: 4.95 m (16 ft); Tonnage: 500 dead weight; British Register Tons: 660; Hold capacity: 1,240 m^3 1,240 barrels; 800 hp; 11.8 kn; trawling speed 4.5 kn; range 28 days; 42 crew.

The second series were processing trawlers built in Poland for white fish with installations for filleting, freezing and storing in refrigerated holds as well as with installations for fish meal and oil extraction, as follows:

> Overall length: 83.0 m (274 ft); Beam: 13.8 m (45.5 ft; Draught: 5.4 m (18 ft); Tonnage: 1,250 dead weight; 2,000 hp; 12.5 kn.

This is a modern ship, rather different from the traditional side trawler as in the first series. The results from the investigations are shown in the following table:

TABLE 1. PARTICIPATION OF REPAIR GROUPS IN THE REPAIRS OF THE INVESTIGATED SIDE TRAWLERS AND PROCESSING TRAWLERS IN DIFFERENT KINDS OF REPAIRS

No	*Kind of repair*	*Class*		*Annual Survey*		*Intervoyage*	
	Group of repairs	*Side trawler*	*Processing trawler*	*Side trawler*	*Processing trawler*	*Side trawler*	*Processing trawler*
	1	2	3	4	5	6	7
1	Hull	24.2	19.2	25.4	20.7	18.1	16.1
2	Machinery	75.8	66.2	74.6	65.0	81.9	71.2
3	Spec. fishing installations	—	14.6	—	14.3	—	12.7
4	Total	100.0	100.0	100.0	100.0	100.0	100.0

Note: In the machinery repair groups of the processing trawlers, repairs of fishing gear are included in smith, electrical and electronic specializations

Analysing these results, the influence of constructional changes on the participation of different specializations can be found. Motor ships need less repairs in machinery rooms per hp than steamships, where boiler repairs are specially large. Pipeline repairs are nearly the same. The biggest difference is in the smith and electrical specializations, as the installed power is larger and there are more installations and machines. This shows the changes in planning and designing of the ship repair yards for a modern fishing fleet. Intervoyage and class repairs were investigated but there was no special difference in the annual survey repairs. No interesting results were obtained from side trawlers' intervoyage repair investigations as there was no significant relationship between the frequency of repairs and the amount of time worked. The possible reasons for this could be different ages of ships, different regions of fishing and therefore different meteorological conditions. Nevertheless, further investigations are being carried out.

In the group of processing trawlers the influence of the number of repairs on the scope of the intervoyage repairs is as follows:

TABLE 2. EXTENT OF REPAIRS PER VOYAGE

Number of the voyage	*Extent of the repair*
1	100
2	108
3	100
4	110
5	92
6	97
7	112
8	136
9	162
10	163
11	162
12	157
13	145

The extreme results after the fifth and ninth voyages are explained as the minimum after the first yearly class repair and maximum before the second yearly class repair. It is supposed, that the pattern could be cyclical with a four-year period. These differences in the extent of the repairs are very important for the planning of repair facilities. The class repairs were investigated for both series of ships, the higher numbers of repairs for processing trawlers were extrapolated, as there was no experimental data for them.

TABLE 3. RELATIVE EXTENT OF CLASS REPAIR

Number of class repairs	*Side trawlers*	*Processing trawlers*
1	100	100
2	100	108
3	121	116
4	143	136
5	143	128
6	146	136

These repairs show that exchange of the machinery of the processing trawler makes the repair much shorter and easier as compared with the traditional side trawler.

FUNDAMENTAL ITEMS IN PLANNING REPAIR FACILITIES

The conditions of performance of the different repair groups define the facilities to be planned. The specialized enterprise, such as a ship repair yard, has better conditions in which to perform the work than the shipowner's workshop. Nevertheless, in Poland the shipowner carries out some repairs. As a rule the planned repairs are executed by a ship repair yard and the others by the shipowner's workshop. Rebuilding is performed by the shipyard. This applies mainly to the middle-sized fishing vessels, because small ships are sometimes fully serviced by the shipowner's workshops if docking installations are available. The situation is different when the ship is under continuous survey. Then the repairs are carried out during the whole period of service by shipowner's facilities and the ship enters the shipyard for docking and hull maintenance. So the system of the classification survey is very important when planning repair facilities in a ship repair yard.

In repair yards two types of docking installations are used:

(a) for ships up to 350 tons lifting weight—slipways. The system is defined by the number of stands to be serviced

(b) for ships above 500 tons—the basic facilities are floating docks. These are not discussed here as they are well known.

It is of interest, however, to point out that increasing importance is being gained now by Syncrolift, which enables ships from 60 to 12,000 tons to be lifted, that is, all groups of fishing vessels. They are not in common use but their advantages should induce the planner to consider the possibility of their use. Syncrolift can be recommended where large numbers of similar units are to be lifted. The time of docking influences the choice of installation, and this time is defined by the extent of repairs to be carried out in dock.

The length of this period is very important, as we compare the low cost of the stand with the very costly dock. The ratio of the docking time to the repair time varies very considerably from 0.12 to 1.

Repairing wharves and their facilities

The characteristics of the repair wharves are their length, the depth of water alongside, the payload capacity and the installations on the wharf. The length of the wharf is defined not only by the number of ships under repair but by the time needed to perform the repair. This time is influenced by the vessel design and the facilities on the wharf.

The size of the ship is not so critical because bigger ships allow an intensification of repairs. The depth of water at the wharf is defined by the draught of the ship, height of wave and silting conditions, etc.

Depths in the ship repair yard are smaller than in the port and as a rule it does not present any special technical problem. The shipyard basins must be thoroughly sheltered from waves. The payload on the wharves is similar to the loading quays.

The installations on the shipyard wharf differ greatly from the port quay. The capacity of the shipyard cranes in most cases is not fully used, as this capacity is defined by the maximum load to be lifted. The number of cranes is determined by the average time of work of the crane per unit of length of the wharf. While servicing fishing vessels this index is 12 working hours per year per running metre as a maximum.

Main ship repair yard shops

Analysing the repairs of the two above-mentioned groups of fishing vessels it was found, that for the side trawler in general the limiting repairs groups, i.e. the critical capacities, are: machine room repairs, boiler repairs and hull-welding, and these groups were considered in the different classes of repairs, as follows:

(a) annual repair 55 per cent
(b) class repair 51 per cent
(c) intervoyage repairs 50.5 per cent.

For the processing trawler the critical groups were: machine room repairs, piping works, smith works and electrical and electronic repairs. These limiting groups were involved in the following cases:

(a) class repair 82 per cent
(b) annual repair 81 per cent
(c) intervoyage repairs 81 per cent.

Co-operation with suppliers

Special care must be paid to suppliers providing service where special accommodation has to be provided as their quick and efficient services are very essential. In Polish conditions such accommodation is prepared for suppliers and manufacturers of: (a) engines, (b) processing plants, (c) navigational and search equipment, (d) freezing installations. In many cases it is not possible for the shipyard itself to perform needed repairs.

The layout of the yard is determined by the applied scheme of work adapted to local conditions and to the flow of materials. At present it seems that only big workshops accommodating several departments give the optimum solution from the technological, economic and cost aspects. A circular layout is to be recommended.

CONCLUSIONS

The number of fishing vessels will increase as the demand on food is still increasing. With increasing numbers more complicated types of fishing vessels will be developed. Diesel-electric drive will be introduced on a larger scale and the demand for repair services will increase, especially in the electrical and engine groups. Automation will be introduced in order to reduce the crew and this will increase and complicate repair and maintenance services.

As the fishing grounds become even more distant, the expedition type of fishing will be developed and the types of fishing vessels will vary according to the tasks performed—mother ships, catchers, liaison ships and transport ships of different sizes and equipment.

The rapid development of the fishing industry today and the demand for tomorrow make further development of the fishing fleet quite certain and it must be considered when planning new ship repair yards or planning modernization of the existing ones.

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A Syncrolift Drydock and Transfer System for Small Fishing Vessels

by J. E. Best

Un système Syncrolift combine cale sèche/transporteur pour les petits bateaux de pêche

Ce document donne une description générale des caractéristiques économiques d'un système Syncrolift cale sèche/transporteur pour des bateaux de pêche jusqu'à environ 150 tonnes de poids et jusqu'à 24,4 à 27,4 m (80 à 90 ft) de long. La cale sèche Syncrolift est un élévateur vertical breveté. Un système servant à déplacer les bateaux du Syncrolift au chantier à terre permet de mettre en cale sèche plusieurs bateaux à la fois avec un seul Syncrolift. Ce document donne la vue de face d'une installation typique ainsi que des photographies des cales sèches Syncrolift.

Dique seco y sistema de transporte "Syncrolift" para pequeñas embarcaciones de pesca

Se hace una descripción general y se discuten las características económicas de un dique seco y sistema de transporte "Syncrolift", apto para embarcaciones de pesca de unas 150 toneladas de peso máximo en dique y de 24,4 a 27,4 m (80 a 90 pies) de eslora. El dique seco "Syncrolift" es un elevador vertical patentado: gracias a un sistema para transportar los barcos que se encuentran en el dique seco a las zonas costeras de trabajo, se pueden poner simultáneamente en el dique seco, con un solo "syncrolift", varias embarcaciones. Acompañan al texto un dibujo en perspectiva de una instalación-tipo y fotografías del "syncrolift".

THIS paper outlines the features of a Syncrolift drydock and transfer system for fishing vessels up to about 150 tons docking weight and 24.4 to 27.4 m (80 to 90 ft) in length. The Syncrolift principle is presently in use for drydocks ranging in capacity from 40 tons to 6,000 tons and the same principle can practically be extended over a much wider capacity range.

A typical 150 ton capacity Syncrolift drydock and transfer system is shown fig 1. Later figures show actual Syncrolift drydocks similar to that shown, on the drawing.

General characteristics of a 150 ton Syncrolift

Lifting capacity, rated	150 long tons
Lifting capacity, net maximum	190 long tons (a)
Number of hoists	4
Maximum gross capacity per hoist	60 long tons
Lifting speed	0.46 m per min (1.5 ft per min)
Platform length	27.4 m (90 ft)
Platform clear width	9.8 m (32 ft)
Platform depth	1.3 m (51 in)
Platform weight, approximate	50 long tons (b)
Vertical travel of platform	6.2 m (20 ft) (c)
Electric power required	See note (d)

(a) Varies with exact platform weight. This capacity for even load distribution among all four hoists.

(b) Varies with types of steel and wood used for platform and includes allowance for cradles and blocking.

(c) 6.2 m (20 ft) is standard vertical travel, additional vertical travel available to suit actual site requirements.

(d) A transformer rating of about 45 kVA is required for a Syncrolift installation served by a high capacity, high voltage distribution system. The actual transformer capacity required depends on the actual characteristics of both the power system and the transformer. If an engine driven generator set is used to power the Syncrolift, the minimum kVA requirement will usually be at least 125 kVA. Power supply to the Syncrolift must be 3 phase, 3 wire. Frequency may be 50 or 60 cycles.

General description

The Syncrolift is basically an elevator of design patented by the Pearlson Engineering Company. The platform of the Syncrolift is lowered into the water vertically and stopped at a predetermined depth. The vessel to be drydocked is floated over the submerged platform. The platform is then raised bringing the vessel vertically out of the water until the vessel and the platform are both completely above the water level.

The platform supports the vessel during the drydocking operation and is raised and lowered by electric hoists connected to the platform with wire rope cables. The hoists are supported by fixed structures on both sides of the platform. These fixed structures are normally constructed of standard reinforced concrete and steel piling.

The elevator platform construction consists of steel structural members similar to the type used in bridge construction and wood planks used as decking over the steel platform. Vessels can be drydocked on the Syncrolift platform using conventional procedures for setting the keel block and placing the bilge blocks against the hull after grounding. The bilge blocks can be pulled when the platform is at any position in its travel. A simple hand crank positions the blocks rapidly.

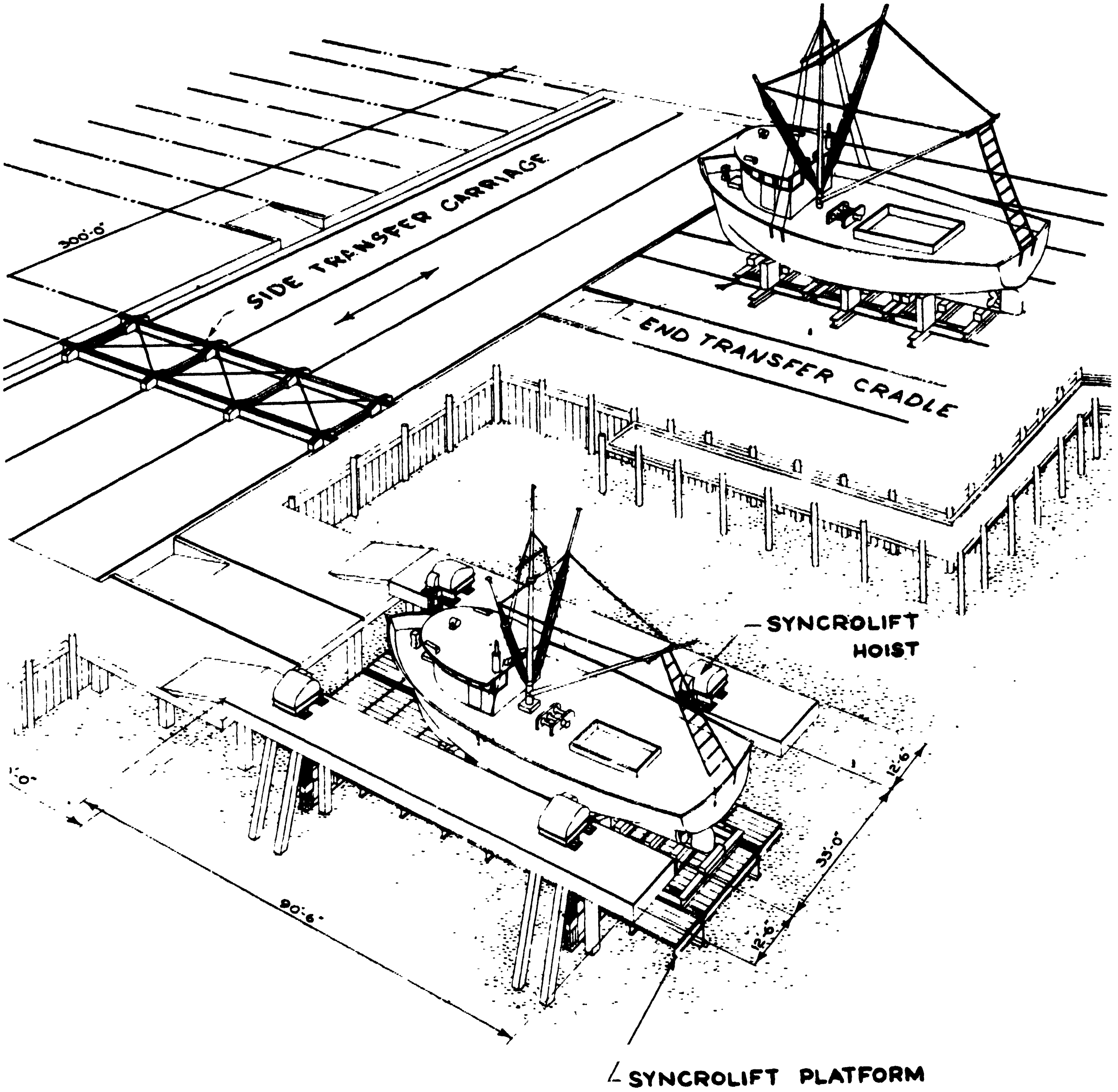

Fig 1. Typical installation. 150 ton capacity Syncrolift and transfer system

Each hoist consists of an electric motor, a reduction gear system, a wire rope cable drum and a double brake arrangement. The electric motor is a special design alternating current synchronous induction motor. The four motors operate at one fixed rate of speed regardless of the load variations imposed by the vessels weight characteristics. All four electric motors are interconnected and controlled at one central control point. In effect, the electrical motors act as though they were connected mechanically together and no variation in speed from one motor to the next is possible. The performance of the electric motors assures constant lifting speed of all the hoists which in turn assures that the elevator platform will be level at all times. In the event of any malfunction of any one motor the entire system is automatically stopped until the malfunction is corrected. The hoist has two separate and distinct braking systems. The motor has an integral magnetic disc brake. The brake releases when power is applied to the motor and engages by spring action when power to the motor is disconnected. The wire rope drum is provided with a ratchet and pawl type backstop. An air cylinder with internal spring actuates the pawl. When the elevator is being operated in the down direction, all pawls are automatically withdrawn from the ratchets by admitting compressed air to the cylinders. Under all other conditions of operation the air cylinders are automatically vented and the pawls are held in contact with the ratchets by the internal springs of the cylinders. The ratchet-pawl system provides security against slippage of the magnetic brake and also permits removal of the motor-brake unit and intermediate gears for maintenance and inspection with full load on the hoist. An interlock in the control system prevents the platform from being operated in the down direction when the pawl is in place and indicator lights on the control panel illuminate when all pawls are retracted.

The central control panel is instrumented to operate the Syncrolift with a minimum number of control settings. All components of the control centre are standard commercially available parts and the operation or maintenance of the control centre is well within the capability of an electrician familiar with standard shipyard equipment. Included in the control centre is an ammeter for each hoist motor. These ammeters indicate the loads carried by each hoist during the operation of the Syncrolift. Safety provisions are incorporated in the control centre to automatically stop all motors instantaneously in the event any one motor is overloaded by a ship weighing more than the designed capacity of the Syncrolift. In this event, the elevator can only be operated in the down direction. It is therefore impossible for the Syncrolift or the ship to be damaged due to overloading of the Syncrolift equipment. Provision is also made to automatically shut off all motors when the platform reaches the upper or lower limits of travel. These upper and lower limits are preset according to the winch foundation level as well as the depth of the water available in way of the platform. An additional limit switch is provided for each motor for automatic levelling of the platform to a predetermined position.

The wire rope system used on all Syncrolifts consists of a six part cable reeving. The cable drum is grooved and long enough to provide for the maximum amount of lift with only a single layer of rope on the drum. Two sheave wheels mounted on the hoist together with the three sheave wheels mounted on the ends of each main lift beam permit the reeving of the wire rope into a six part cable support at each hoist. The controls make it possible to automatically remove any wire rope cable stretch which might occur during the life of the Syncrolift. This automatic stretch removal is accomplished by the use of limit switches which stop each hoist when the main beams reach a predetermined level. The main beams will always return to their original preset level regardless of any small variation in cable length during the hoisting operation. The cable stretch from one operation to the next is very small in magnitude and has no practical effect on drydocking operation.

TRANSFER SYSTEM

The function of the transfer system is to move vessels between the Syncrolift and designated work areas ashore. The transfer system is developed in conjunction with the Syncrolift and is designed for drydocking vessels of all types having a docking weight within the capacity of the Syncrolift. Due to the fact that the Syncrolift platform remains level at all times, a transfer system can be readily added to a basic Syncrolift installation. Railroad type rails are installed on the platform and on the land area adjacent to the platform. These rails are installed so that a transfer cradle can be rolled from the platform to the land area when the platform is raised to the transfer level. A further extension of the rails on the land area can develop a transfer system which will permit movement of the cradles in both longitudinal and transverse directions.

A vessel is drydocked on conventional timber blocking

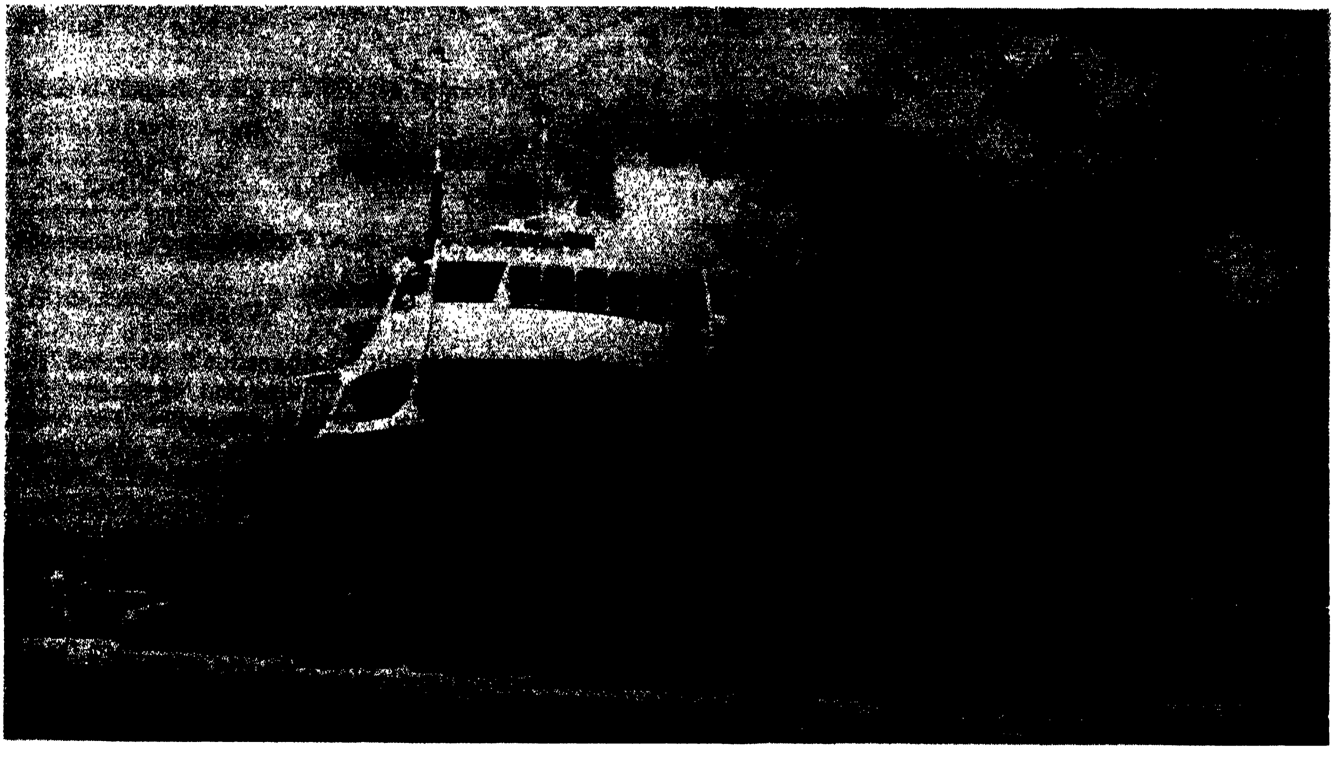

Fig 2. A Syncrolift in operation

located according to the vessel's docking plan. A vessel that is to be transferred is blocked on wheeled carriages and remains on these carriages the entire time it is drydocked. Newly constructed vessels may be built on fixed blocking which is replaced with transfer carriages when the vessel is ready for launching.

The arrangement of a typical transfer system is shown on the accompanying plan. The transfer cradles are designed for the maximum practical flexibility in the placement of keel and bilge blocks. The wheels are fitted with grease lubricated and sealed roller bearings in order to reduce the required transfer force to a practical minimum. The transfer force is provided either by tractors or power winches.

When the Syncrolift platform is at pier level (transfer position) the platform rails line up with the shore rails and portable sections of rails are used to provide a smooth transition from the platform rails to the shore rails.

The rail section generally recommended is an 85 lb section A.S.C.E. This rail has the required characteristics for a practical installation and is normally available new or in good used condition.

The platform rails are attached directly to the platform deck. The shore rails may be supported in a variety of ways, for example:

(a) Rails supported by ties set in rock ballast
(b) Rails supported on top of continuous concrete footings
(c) Rails set flush in continuous concrete footings.

Crushed rock, hard fill, asphalt paving, concrete, or the natural soil may be used for the working area and be made level with the rail tops to provide a flat surface for rolling equipment.

ECONOMIC CONSIDERATIONS

The initial cost of a 150 ton Syncrolift drydock, exclusive of transfer system and associated boatyard costs could be:

Syncrolift machinery	U.S. $51,300.00(a)
Platform materials	12,500.00(b)
Piers	8,000.00(c)
Installation	7,400.00(d)
Total	U.S. $79,200.00

(a) Approximate 1968 C.I.F. price delivered to any world port, exclusive of import duties and taxes,
(b) Estimated cost of platform materials ready for field erection,
(c) Estimated cost for normal type piled structure with good foundation conditions,
(d) Installation of machinery and platform, including rigging of wire ropes and electrical work from Syncrolift control centre to hoist.

Transfer system costs will vary with soil conditions, the number of vessels to be accommodated, and the type of motive power employed. As a rough estimate it can be assumed that complete transfer facilities (cradles, rails, rail foundations, transfer system motive power) for each full size 150 ton vessel will cost between 10 per cent and 15 per cent of the cost of the basic Syncrolift installation, or from about $8,000.00 to $12,000.00 for each 150 ton vessel for the installation described.

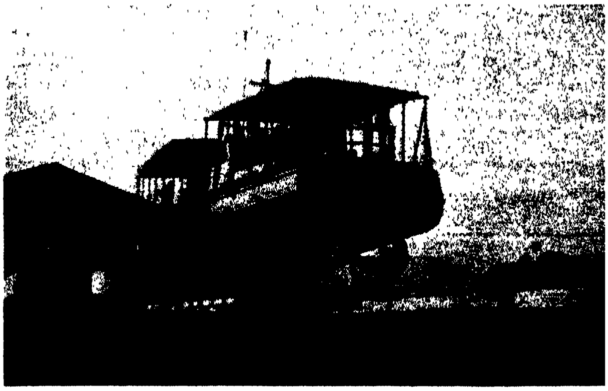

Fig 3. Showing details of a typical Syncrolift supporting structure

Fig 4. Small Syncrolift installation

Fig 5. Preparing the platform prior to lifting a small vessel

Installation, operation and maintenance

All electrical and mechanical parts used in building a Syncrolift are easily installed, operated, and maintained. The Syncrolift hoist is similar in appearance to cable hoists commonly used by the marine industry. Fabrication and erection of the platform and installation of the hoists and the controls may be accomplished with shipyard personnel. All electrical control parts are standard components and

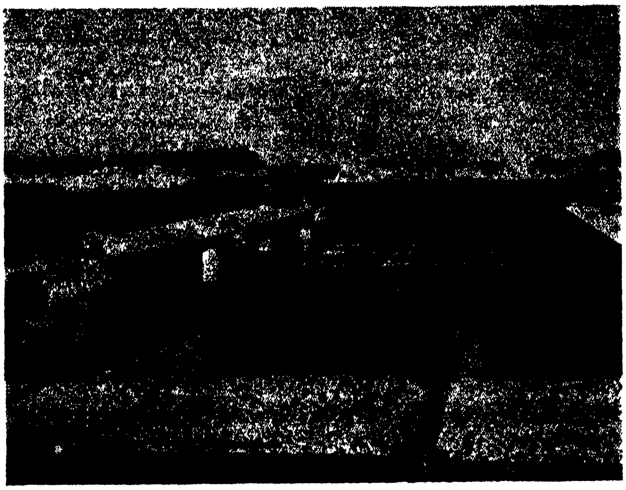

Fig 6. A Syncrolift suitable for fishing vessels

spares are readily available. All mechanical and electrical components have been designed and proven in service for climates ranging from tropic to arctic.

A Syncrolift drydock and transfer system in combination with well organized yard facilities can consistently drydock, repair, and launch an average of two to three vessels daily. The transfer system can be utilized to place vessels in the most advantageous yard location for the type of work to be performed, in effect creating an assembly line for both repairs and new vessel construction.

A typical crew for drydocking a 150 ton vessel would be a dockmaster to operate the Syncrolift and supervise the overall operation and two to four men to manoeuvre the vessel in and out of the Syncrolift. As soon as the vessel has grounded and the bilge blocks are set, only the dockmaster need remain at the Syncrolift. Transfer operations can be conducted easily by only two men.

Even without transfer facilities the Syncrolift is economically sound, and the transfer system can be added gradually to suit demand. A Syncrolift provides a maximum of clear, level working area at yard elevation in a minimum amount of space. There are no wingwalls or other obstructions alongside the vessel. Consequently, vessel repairs can be performed on the Syncrolift under conditions of high efficiency and safety.

Syncrolift maintenance is simple and can be performed at any convenient time, even when a vessel is on the platform. The platform rises completely out of the water and the wood decking can be easily removed to facilitate inspection and maintenance of the steel structure. Maintenance of the wire ropes and the hoists consists mainly of lubrication. Electrical equipment requires very little maintenance. Syncrolift equipment consists of multiples of standard units thereby keeping spare parts inventory low. All Syncrolift components are types of equipment familiar to the normal repair yard personnel.

DISCUSSION

VESSEL SERVICING FACILITIES

Gifford (UK—Chairman) said he would like to define servicing as being divided between maintenance and supply: everybody was well aware of the need for making the best use of money invested in a fishing fleet. One of the methods of achieving high utilization was by efficient vessel servicing facilities. A second method was by a properly planned transportation system.

Maintenance might be divided into four groups:

1. **Hulls:** Arrangements for hull maintenance. Recognition must be given to the different materials, timber, steel and glass reinforced plastic and their relative requirements. An expensive but essential provision for hull maintenance was the slipway for removing the craft from the water. These might be of a conventional kind or they might be of a Syncrolift type. It was also possible to devise very simple and inexpensive forms of slipways for smaller boats which very often lacked this facility, and had to travel considerable distances to a slipway with resulting loss of time.
2. **Engines:** Large workshops were needed as part of a shipyard complex for the big ports, and provision for this kind of maintenance was not usually a difficulty, but the smaller port had the greater problem. When there was not a sufficient commercial demand for service, the small fisherman often suffered. Agencies should be established by manufacturers in district ports so that they could service a number of local ports. In some cases local garages should be trained as agents and carry stocks of spares. The design of small engines might perhaps be a little off the subject under discussion but they should be chosen for reliability and ease of maintenance rather than for fuel and weight efficiency.
3. **Gear:** Here agencies should provide for maintenance otherwise the smaller ports suffered a lack, particularly if they were in an older area.
4. **Instruments:** The maintenance of instruments, particularly the electronic kind, was becoming more important in navigation even down to fishing craft as small as 10 m in length. Fishermen were becoming more dependent on electronic gear and the efficiency of their maintenance was most essential. However, there was a very great shortage of both facilities for this maintenance and in particular of men trained in it. The development of training schemes by technical colleges and the like to supply this need should be encouraged.

On services, the main items were the supply of fuel and ice. Another subject on supply was the method of handling boats in harbour. In Grimsby and Ostend, the boats were taken by special crews to ice and fuel whereas in other ports, such as in France, the supplies were taken to the boats. Clearly there must be reasons for this and advantages of one method against the other which he hoped might be discussed.

Syncrolifts in West Indies

Key (UK) told of two Syncrolift installations in the Eastern Caribbean. A 750 ton installation had been completed in Chaguaramas, Trinidad, in 1966 and formed part of a dockyard, which included a 12,000 ton floating dock. Longitudinal transfer berths were also provided. A 230 ton installation was completed in St Georges, Grenada, in 1967, forming part of the maintenance facilities in a yacht marina. It handled a wide range of commercial craft and yachts.

The Trinidad Syncrolift suffered a failure of part of the platform in operation in 1966, probably due to a sheave housing failure. An investigation was carried out into the system by the owners, the benefits of which have since been applied in the present Syncrolifts. His experience had been that costs in the West Indies had been a lot higher than those given in Best's paper.

A mechanical bilge block system was installed in Trinidad but was found difficult to operate in practice and was subsequently abandoned. Maintenance of the steel platform structure could be carried out in dry conditions, but great care had to be taken to avoid points which could trap water on the lower flange of the main beams. Allowance must be made in the design of the supporting structures for horizontal forces and care must be taken in assessing forces arising from hauling ships on and off the platform. The electrical load might prove high in a remote location and it might be desirable to reduce the rate of lifting.

Both Syncrolifts were proving successful and plans were in hand to expand them. The comparison of total investment involved in a Syncrolift compared with a slipway was largely dependent on the site. Both sites fell steeply from shoreline to operating depth and thus strongly favoured the Syncrolift. In Caribbean conditions of relatively small tidal range a slipway necessarily involved either underwater work or a coffer dam, both of which were costly.

Loading ice and fuel

Jackson (Ireland) said that on a servicing quay, it was customary to provide a number of service points at which boats could take on water and fuel oil. The ice plant was frequently placed on the quayside and boats lay under its discharge hopper while taking ice on board or use was made of an overhead conveyor to discharge the ice at various points along the quay thus avoiding the necessity for queuing. The Irish delegation was considering the possibility of providing ice at service points by means of pumping from the ice plant. This should dispense with the necessity of building the ice plant on the quayside thus freeing valuable quay space for other purposes.

Hopper (UK) said that the White Fish Authority's industrial Development Unit had a limited amount of experience in the pneumatic transfer of ice on board vessels over short distances. There were no real problems on the pneumatic side, but the mechanical ice crusher used to produce pellets suitable for transfer was susceptible to clogging by ice slush either due to ambient air temperatures or the heat generated by the mechanical parts. It was mainly a question of the temperature and condition of the ice.

Favazza (USA) said that in Massachusetts they had an adequate number of fuel oil suppliers, but in competing with each other they had, over recent years, bought up most of the fishing docks in Gloucester harbour. Now vessel owners were offered docking facilities free of charge, but on condition that the vessel's fuel oil must be bought from the supplier/dock owner and this had led to fuel oil prices being substantially higher than those in surrounding ports. He asked how it was possible to combat this unhealthy situation.

Maintaining small engines

Hjul (UK) stated that in areas where small boats were operated from many landing places, maintaining and repairing engines was a great problem. One answer was to supply a simple reliable engine in which high performance was secondary to durability and ease of maintenance.

Another answer was to train local motor or tractor mechanics in marine engine maintenance. In recent years the Irish Sea Fisheries Board had designed an efficient double-ended open boat, powered mainly by small British Lister diesel engines. Along with the supply of these engines, the manufacturers had instructed local mechanics in their maintenance. This scheme seemed to be working satisfactorily.

O'Meallåin (Ireland) remarked, that about ten years ago a beginning had been made towards increasing the productivity of part-time fishermen in remote places by providing specially designed boats. This had been done where sheltered harbour works were not practicable and where the type of fishing pursued was seasonal, mainly lobster fishing and drift netting for salmon. These activities could be most effectively carried out in small vessels. The boats in question were derived from the double-ended Greencastle yawl, but they were not double-ended. In order to accommodate an economic number of lobster pots the boats were transom-sterned. They varied in length from 26 to 32 feet. The maximum size of engine used was 10 hp and many of the boats were fitted with pot haulers. The fishing pursued had been lucrative, but it was clear that where the fishing seasons were short, loss of fishing time could be serious. Effective engine maintenance was therefore of importance, as it could hardly be expected that there would be expert maintenance fitters resident at every small port. The maintenance arrangements described by Hjul appeared to work very satisfactorily.

Fergusson (Barbados) mentioned that in Barbados they had had problems in converting the fishing fleet. The fleet consisted of small sailing vessels up to 1952 when a number of motorized double-enders were built which were found to be more manoeuvrable. The Government supplied engineers who checked on the engines every two weeks or so after estimating the number of hours worked. Some of the engines were 14 years old and had given good service. Air-cooled engines were found not to give good service and water-cooled engines were therefore used.

Problems in small ports

Stammers (UK) said that the use of the relatively complex Syncrolift type of slipway was not desirable in small fishing ports in developing countries where expert maintenance was not readily available. He thought that the additional capital cost of a normal slipway was worthwhile when weighed against the disadvantages of added maintenance complexity and cost.

Hjul (UK) stated that the Tyrell boat building and repair yard in Wicklow on the east coast of Ireland installed last year a Syncrolift mainly to handle the fishing boats operating in the Irish Sea. He also mentioned a Syncrolift in a Vancouver repair yard which was handling fishing boats. He asked the Irish or Canadian participants to give some more information about these installations.

Shiel (Ireland) said that the Syncrolift boatlift referred to had been in operation for some years and apparently had worked very satisfactorily. In Ireland Syncrolifts were used to operate the car ferry ramps in the ports of Dun Laoghaire and Dublin and these two had given satisfactory service. It was now proposed to provide Syncrolift boat-lifts in the fishery harbours of Dunmore East, Killybegs and Castletownbere.

Key (UK) remarked, in reply to Stammer's point regarding maintenance in relatively unsophisticated areas, that he did not feel that a problem existed as long as the maintenance was within the capability of the man who would be on hand to repair the ships.

Fergusson (Barbados) stated that in Barbados they used rollers six to eight inches in diameter to haul up boats in sand or soft silt. Three broad planks were placed under the rollers to prevent them from sinking in the sand. Tractors hauled up the boats and the operation had been quite successful.

Great difficulties had been experienced with gear boxes and outboard bearings due to misalignment through not disconnecting the propeller shaft coupling from the engine coupling. There had also been some trouble with boats operating in shallow water through approaching at fast speeds and then backing up, causing sand to enter the outboard bearing and causing excessive wear.

Varied worries

Guckian (FAO) said that, regarding Syncrolifts, a good case for establishing a boatyard with a lift could be made where water space was small, and a slipway of 350 to 500 ft long with lead-in jetty alongside was impractical.

Commenting on mechanization, he mentioned that canoes and catamarans were vessels of ancient design, and he did not believe that their mechanization with sophisticated equipment would work; the improvement was meagre and was fraught with great difficulties of maintenance and spares. In most countries this development step was becoming unpopular and 30 ft boats were much more effective, but for these harbour facilities were necessary.

Pérez Bellod (Spain) described a small device used in the port of Arenys de Mar near Barcelona and other small Spanish ports. In order to cheapen and simplify the slipping, a sort of trolley was built which had mobile lateral devices and a small tower for the operator. When the vessel was placed on the trolley on the slipways the worker in the tower operated the side parts, thus moving the vessel and enabling it to be hauled out on the slipway without divers or any other costly operation.

Bruski (Poland) commented on the problems of larger fishing vessels and noted that wharves were often not well sited and the maintenance of these wharves also had to be taken into consideration. On fleet maintenance, he said that better equipment and spare parts meant less maintenance and repair work. The maintenance requirements of different classes of vessels and the implications for planning the harbour facilities were being considered at great length in Poland now. He stressed the importance of co-operation between all parties concerned in port development.

American experience

Lafouge (France) mentioned a new equipment which at present was being built in the United States, hoping that the members of the United States delegation might perhaps give information on the subject. This method was not at present used for fishing boats, but it was used in pleasure craft ports for docking and launching vessels. There was a travel lift in use which was a kind of mobile equipment on wheels and could raise the vessels with bridles. Then the load was lifted and carried on land which was very useful. The lift was so simple to operate, rapid, and in his view, much better than the rather more obsolescent methods at present used in France.

Hurst (Canada) said three Syncrolifts were in operation in Canada, one on the west coast owned by B.C. Tug Ltd. for maintenance of its own fleet. Difficulty arose if the load was not properly centred and the power supply would trip if one cable overloaded. Another one had difficulties with ice when water became trapped and fractured structural points when frozen. He thought the Syncrolift was a sophisticated device and should be only associated with a proper shipyard.

Norman (UK) said that a suggestion to minimize damage to stern gear of beach landing vessels could be drawn from English Channel luggers. These were fitted with a heavy keel and sole piece under the aperture but, even more important, they had hulls extending well abaft the rudder position which provided additional buoyancy on entering the water. This was instrumental in obviating damage aft.

Pontoon docks

Whiteford (UK) said that the use of pontoon docks in small fishing installations had been applied for many years in the North East ports. With modern techniques, including possible use of the control tower mentioned by the Spanish delegate, an efficient unit could be designed which could be reasonably maintained, e.g. through the use of plastic and fibre glass in the construction. The pontoon dock could either be attached to the quay wall or possibly otherwise contained under rougher conditions. Provision of side-dipping, etc., could also be arranged.

Osborn (UK) suggested the use of prestressed concrete platforms for Syncrolifts to reduce maintenance costs and the use of hovercraft type of platforms for hauling out small craft over soft beaches and possibly through surf.

Lomeli Delgado (Mexico) said that developing countries, including Mexico, as a rule were lacking qualified experts in fisheries development, from the catch to vessel servicing and maintenance. He recommended that FAO should request member governments to train experts at this intermediate level in fisheries development.

Engvall (FAO) remarked that FAO had not yet developed any solutions to the problem of easily maintained and operated engines in developing countries. However, manufacturers had been asked to make simple engines and to open local branches in order to supply spare parts in the countries concerned. He was of the opinion that the only solution was that private firms engage themselves on a profit making basis. The start might be difficult but it could be subsidized by the home country as a form of aid. The Japanese were working along these lines. He thought it difficult for FAO in the smaller mechanization projects to develop shore facilities and train personnel to a sufficient extent.

Simple Dutch device

Van der Waard (Netherlands) said that in Holland quite recently a very simple ship lifting device had been developed which could be of use especially in areas where maintenance of more sophisticated systems involved a problem. The system was similar to the Syncrolift system, but instead of hoists a system of racks and pinions was used. For lifting fishing vessels up to 150 tons four racks were required. The racks were fixed to a concrete construction on piles. The four pinions fixed to the lift platform were driven by an electrometer (or diesel engine) placed in a watertight compartment of the platform. This system of racks and pinions was very resistant to wear and tear and there were no problems of synchronization. A prototype of 20 tons capacity had been in operation for 3–4 years and the results were considered quite satisfactory.

Dalman (UK) stated, in defence of the oil companies, that in Tema, Ghana, six active petroleum distributor companies had combined to provide a joint bunkering facility. It had three 30 ft diameter × 35 ft high tanks with distribution pipes along the quay and outlets were at 250 ft centres in the outer harbour and at 150 ft centres in the inner harbour. No information was available on charges but the benefits of the system would not have been available to craft without the enterprise of these private concerns.

Other solutions

Breimer (Rapporteur) said that in a paper to the PIANC-Conference in Stockholm, 1965, he had touched upon the problems of how to get a boat on shore. First, instead of a normal slipway, it was possible to have a concrete slab sloping 1 : 12 and a cradle on two wheels with normal car tyres, the cradle connected by wire to a simple winch. Another alternative was to have a derrick on the quay and simply lift the vessel out of the water. It was also feasible to have a truck provided with a fork-lift, driving the truck to the edge of the quay and lowering the fork-lift into the water, when it would be possible to place the fishing boat anywhere ashore.

With regard to district harbours, the sizes of the vessels were normally such that traditional slipways or Syncrolifts were needed. Also for nation-wide harbours, slipways or Syncrolifts or perhaps drydocks or floating docks were needed. At a small local harbour, the facilities for bringing the vessels out of the water should be situated within the harbour area.

For convenience, the repair yard should be located as close as possible to the place where the catch was unloaded.

He described the situation at Gothenburg in Sweden, where the fishermen were living on several islands outside the mouth of the Göta River, each island having one or more harbours called home ports. Coming in to deliver their catch ashore, the fishing boats would pass their home ports and go directly several miles up the river to unload at the market harbour where the boats would stay only as long as necessary for the unloading. Then they would go downstream to their home port. In Gothenburg and on two or three islands in the archipelago there were shipyards specialized in building and repairing fishing boats. So here it was possible to find three different kinds of harbours. The unloading harbour, the home port, and the repair harbour.

SESSION X

British Deep-sea Fishing and its Impact on Port Facilities and Services

by T. C. Jones, D. A. Lintern, W. B. Robb and D. A. Woodcock

Les tendances de la pêche hauturière britannique et leurs répercussions sur les installations et services

La communication examine les tendances actuelles de la technologie et de l'exploitation des navires de pêche britanniques, notamment ceux qui font des sorties de 16 jours ou plus, et leurs incidences sur les installations portuaires. Le fait saillant est la congélation à bord des grands chalutiers, dont le Royaume-Uni possède actuellement 25. Le débarquement de prises congelées en mer entraîne d'importantes modifications des méthodes tant à quai que dans les installations annexes—entrepôts frigorifiques et ateliers de décongélation. De plus, les caractéristiques du produit imposent une revision de la structure des circuits de distribution. La réduction concomitante des mises à terre de poisson frais entraîne la sous-utilisation de nombreuses installations existantes, par exemple, fabriques de glace.

Tendencias en la pesca de altura británica y sus repercusiones sobre las instalaciones y servicios

En este trabajo se examinan varias tendencias actuales de la tecnología y funcionamiento de los buques de pesca británicos particularmente los que hacen salidas de 16 días o más y las repercusiones de tales tendencias en relación con las instalaciones y servicios portuarios. La novedad principal es la congelación del pescado en el mar por medio de grandes arrastreros de los cuales existen en la actualidad en el Reino Unido 25. El desembarque del pescado congelado en el mar ha llevado consigo cambios considerables en los métodos aplicados tanto en los muelles como en las instalaciones conexas, tales como los almacenes frigoríficos y las instalaciones de descongelación. Igualmente, las especiales cualidades del producto están determinando cambios en la estructura de su distribución. La consiguiente reducción de los desembarques de pescado fresco ha determinado una incompleta utilización de muchas de las instalaciones y servicios existentes tales como las fábricas de hielo.

FOR the purpose of this paper British deep-sea fishing is taken to refer to the activities of vessels which make trips lasting seven days or more and includes wooden trawlers and seiners as well as steel trawlers and the bigger freezer trawlers. The most significant trends are to be found in the distant water section of the fleet, i.e., vessels which are at sea for upwards of 16 days, and the paper is mainly concerned with these vessels. These vessels have to go long distances to catch fish and have to preserve their catches for upwards of 11 days before landing, and also have to maintain an economic relationship between steaming and fishing time.

The most significant trend in recent years has been, and still is, the move by vessel owners to replace older conventional wet fish trawlers with vessels capable of freezing their catch at sea and keeping it at sub-zero temperature until return to port. Provided always that good standards of freezing and cold storage temperatures are observed the product landed is of first class quality suitable for almost all types of processing.

Development of freezing at sea

The first built British freezer trawlers were factory vessels filleting much of their catch before freezing it and processing the offal into fishmeal. Subsequent trials showed that freezing at sea could be satisfactorily carried out on vessels comparable in size to wet fish trawlers and no large factory vessels have been built since the three *Fairtrys* came into service. The freezer trawlers have been designed to freeze the whole of their catch in blocks of gutted whole or headless fish which are subsequently stored at a temperature of −20°F. Although a few vessels have been designed to fillet fish at sea before freezing, the bulk of the freezer trawlers in the United Kingdom freeze whole fish in the way described.

At present there are 25 of these vessels operating in the United Kingdom, 21 of them based at Hull and Grimsby, three at North Shields and one at Fleetwood. The *Fairtry* vessels are at present laid up.

Table 1 shows the quantity of fish landed at the two major ports by distant water vessels. It will be seen that the trend is for an increase in the quantity of fish being frozen at sea in distant water vessels and a reduction in wet fish landings.

TABLE 1. LANDINGS OF WET AND FROZEN FISH AT THE TWO MAJOR PORTS

	Wet fish (tons)			*Frozen fish (tons)*		
	Grimsby	*Hull*	*Total*	*Grimsby*	*Hull*	*Total*
1960	101,787	214,328	316,115	—	—	—
1961	86,825	212,266	299,091	—	539	539
1962	97,698	221,448	319,146	—	2,563	2,563
1963	83,879	186,875	270,754	141	4,506	4,647
1964	76,985	170,443	247,428	1,557	4,874	6,431
1965	76,721	168,179	244,900	4,975	13,205	18,180
1966	72,767	156,750	229,426	8,448	22,672	31,120
1967 (January to July)	44,028	90,989	135,017	8,456	21,050	29,506

Landings of sea frozen fish at quayside

The landing of frozen fish in blocks, whether in fillet form or whole fish, has led to radical changes at the ports and the problems presented have not yet been completely solved. The normal method of landing iced fish is by means of baskets filled in the fishroom raised by winch to the quayside where the fish is sorted, weighed and displayed for sale in the market area. Unloading starts in the early hours of the morning so that the auction can commence at about 07:30.

The methods used to discharge wet fish are not, however, suitable for unloading frozen blocks. At both Hull and Grimsby berths have been allocated for the particular use of freezer trawlers and the frozen blocks are unloaded by means of some type of conveyor. No standard method of loading has yet been adopted, though the most common is the banana type of conveyor. The blocks are sorted and palletized on the quayside ready for transfer to cold stores. Probably the ultimate in the discharge of freezer trawlers would be achieved when the trawler could be loaded into cold stores direct by conveyor. This is the sort of innovation which could perhaps be provided in the development of a new port, but in existing fishing ports where congestion has long been a problem this is seldom possible. There is inevitably some delay between unloading and getting the fish into cold stores leading to some loss in quality because of a rise in temperature. There is need for special berths to be available for handling freezer trawlers.

It has long been considered feasible for freezer trawlers to land at a port other than a fishing port. Given adequate cold storage facilities this is certainly a possibility, for frozen blocks could be moved by refrigerated transport to factories for processing. Probably the biggest resistance to be overcome is that of the crews, but in a small country such as the United Kingdom it should be possible for crews to be taken to their homes immediately the vessel docked. Since almost all freezer trawlers fish in the Northwest Atlantic some advantage might be gained if their base of operations was nearer to the fishing grounds, in that steaming time would be reduced. On the whole, however, there may be greater advantage in remaining at an established port than in transferring to another where a new industry would have to be built up.

At both Hull and Grimsby frozen fish is unloaded by gangs of men who have been used to discharging wet fish. Because blocks of frozen fish require different handling there may be a case for creating special gangs for unloading freezer trawlers. A start has already been made, but until there are more freezer trawlers special gangs may be uneconomic. With freezer trawlers, unloading can be undertaken in ordinary day-time working hours instead of throughout the night as is the case with wet fish. This is possible because there is no market deadline to meet.

An inevitable consequence of the increase in frozen fish is the increased demand for sub-zero cold storage. In Hull the cold storage capacity has increased threefold in the last six years and in Grimsby the total cold storage capacity is now of the order of 150,000 tons. Almost all these cold stores are capable of operating at -20°F.

Processing and marketing of sea frozen fish

Thawing is a necessary pre-condition to processing sea frozen fish and this has led to developing thawing plants. The most common kind of plant utilizes warm moist air as the thawing medium and is capable of thawing a block of 100 lb of frozen fish in between 3½ and 4 h.

Sea frozen fish is normally handled by merchanting companies owned by the trawler owners or by some of the very large processors. These companies have benefited by sea frozen fish in that they are less dependent on auction vagaries. Consistent prices and quality are now becoming significant features of this distributive chain.

Sea frozen fish is ideally suited for quick frozen products such as fish fingers and fish portions. Studies carried out by the White Fish Authority's Economic Research Unit indicate that the greatest potential for growth in the marketing of fish in the next few years lies in the quick frozen section, particularly in consumer packs. The trend towards increased landings of sea frozen fish encourages this development. Because of consistent quality, thawed sea frozen fish is particularly suitable for pre-packaging and distribution, not only through the normal retail fish shop, but also through self-service stores and supermarkets. Trials of pre-packaged fish have shown that it is most important to use fish of a known high quality and the product of freezer trawlers has given this development an impact which must have repercussions on the facilities for pre-packaging at the major ports. Sea frozen fish is also an admirable product for bulk buying to a detailed specification by large retail organizations.

Other effects of growth of freezing at sea

The decrease in the quantity of wet fish being landed is a trend which will undoubtedly continue and the effect has already been felt by wholesale fish merchants who now have to make good that shortfall by arranging for fish to be brought overland from inshore ports. In turn this has improved the marketing of inshore fish and at the same time made the inshore fishermen more aware and conscious of the need to maintain a high quality product. Flake ice plants have become a feature of many of the inshore ports.

With reduced numbers of conventional vessels operating from major ports there has naturally been a consequential decline in the quantity of ice required. At Hull, the daily production rate has dropped by about 25 per cent. Ice plants are no longer working to maximum capacity and this might ultimately increase the unit cost of production.

A direct, but rather unexpected, development ashore from freezing fish at sea has been the installation at Hull of a small canning plant to deal with a seasonal supply of good quality sea frozen roes. This has proved a successful venture and the possibility of canning other fish products is now being investigated.

BOXING FISH AT SEA

So far boxing at sea is not being practised to any extent on distant water vessels, though slowly it is gaining ground in the near and middle water sections of the fleet. The White Fish Authority is firmly convinced that this development should be encouraged and is giving owners every assistance to that end. There are obvious advantages in this development, e.g., quality is improved, weight loss reduced and a better fillet yield obtained. Carried to its logical conclusion, and when operated by a majority of vessels, boxing at sea offers a variety of ways in which the industry can be developed.

Its large-scale operation would ideally involve the setting up of a nation-wide box pool and the introduction of a standard type of box for general use. Boxing at sea is comparatively easy to introduce in a country setting up a new fishing industry, but its introduction in a well-established industry is not easy. Different methods of unloading are needed and the boxes lend themselves to mechanical handling. All this must have a tremendous impact on facilities services.

Once landed, boxed fish could greatly facilitate quality control for each box contains fish of known history. Boxes can be stacked and the space required for display on the market greatly reduced. Once this system of landing boxed fish with the box marked with the type of fish, day of catch, etc., is under way the need to examine closely before purchasing will disappear and time will be saved and congestion abolished. It is not perhaps too unrealistic to suggest that buying by sample in a central hall becomes a possibility.

The repercussions ashore are great in that the present type of market trunk is eliminated, and box washing plants and storage space for spare boxes become essential. Ideally it ought to be possible for a trawler to land at any port where boxes are available, and take on board a new supply of clean boxes.

SUPERCHILLING

The trend towards boxing at sea lends itself to another project in which there is keen interest, i.e., superchilling. Whilst freezing at sea appears to be possibly the logical answer to the long-distance voyages of the United Kingdom, superchilling holds out the possibility of being a useful means of improving the quality of wet fish now landed by conventional wet fish trawlers. Its wide adoption would make demands on the area available in the immediate vicinity of the market to enable the fish to be thawed sufficiently to enable filleting to be undertaken.

TRANSFER OF FISH AT SEA

Boxing at sea also lends itself to another development viz. the transfer of fish from one vessel to another whilst at sea. Experiments have already shown it to be possible for boxed fish to be transferred at reasonable speeds even in high winds. Fleeting operations where one vessel collects the catch of several others is a distinct possibility. This is as yet not so much a trend as a possibility.

INDUSTRIAL FISHING

The seine net fleet consisting of vessels up to about 65 ft in length based on the Humber until recent years has been laid up during winter months. The trend in the last three or four years has been for these vessels to be equipped for spratting purely for industrial purposes. Generally speaking this species is not used for other than conversion to fishmeal. This trend has led to the introduction of new methods of landing fish not meant for human consumption. The system has been mechanized and the fish is removed from fish-hold to offal truck in one operation. Repercussions on fishmeal factories have been quite significant for, because of the oily nature of sprats, they have to be processed separately and oil extraction has become more important. Whether or not this trend becomes more widespread and embraces other varieties remains to be seen, but, if it does, quite clearly much greater processing facilities will have to be available.

MISCELLANEOUS TRENDS

In the last 15 years the North Sea coal-burning steel trawler fleet has been completely eliminated and replaced to a large extent by wooden vessels of about 65 to 70 ft in length capable of performing the same operations with a lesser number of crew and much more economically. Motor vessels have replaced coal burners. The main effect has been to eliminate the need for coaling points with their fixed cranes and railway tracks. Coupled with the change to road transport for distribution, the disappearance of the railway lines in the market area has greatly improved mobility.

DEVELOPMENT OF FISH PRODUCTS

Certain varieties of fish, particularly redfish and saithe, have not been easy to dispose of for human consumption in the United Kingdom. Fishing vessels are able to catch substantial quantities of these varieties and attempts have been made to develop fish products to absorb these varieties. Exercises in marketing such products as fish sausages, fish crisps, etc., are still incomplete but should they be successful the need for suitable processing plants will be self-evident.

BUILDING NEW PORTS OR ADAPTING OLD PORTS

It should be borne in mind that the major fishing ports in the United Kingdom have developed over the last hundred years or so and various factors have influenced their growth. Their geographical relationships to the main fishing grounds and to the major centres of consumption have obviously been prime factors. Their development was very closely related to the growth of railway lines linking ports with main inland towns and cities. Much of the original work on the docks was carried out by the railway companies to increase their trade and develop the fishing industry. Many of the major docks and their facilities are still owned by the Railway Authorities.

However, as the industry has changed over the years these factors have become less significant. Whilst the North Sea remains important, other and more distant areas have been exploited and it may well be that in future British vessels will have to go even further afield to catch fish at an economic rate. In such circumstances it could be argued that ports now in existence are not most conveniently situated for trawlers working new fishing grounds. On the other hand, recruiting crews elsewhere or housing transferred crews is an extremely important restriction in considering an alternative location.

While during the last century fast railway links with centres of population were all-important, today's development of motor transport and trunk roads make them unnecessary.

Current trends in deep-sea fishing suggest that facilities are required at the ports now which are very different from what has been necessary in the past. In particular the advent of freezer trawlers has led and is still leading to radical changes in port requirements. Methods of discharge are changing. Separate berths have been allocated to the unloading of freezer trawlers but because of the already congested state of existing markets the arrangements have been of necessity less than ideal. Cold storage accommodation has had to be built where space was available and not where it might have been placed in a properly planned development.

At first glance it seems quite attractive to construct new ports to meet new requirements. Such a venture would enable the planners to provide for the inevitable developments of the future. In certain countries it has been possible to plan the layout of the market and all the facilities and services. But the cost of constructing a new port and developing it is enormous and it is difficult to see what justification there can be for a capital investment running into several millions of pounds when established fishing ports, albeit without the benefit of planning, exist and meet the industry's needs reasonably well.

Above all a fishing port consists of much more than merely berthing facilities and processing factories. All sorts of ancillary trades must be provided which are dependent not only on the fishing industry, but on other industries in the neighbourhood. The crews, filleters and other fish workers are usually brought up in a fishing atmosphere and family ties are strong. A son follows in his father's footsteps whether he be a fisherman, filleter, or an unloader of fishing vessels. To a great extent this tradition has been built up because fishing families live in a community near the fish docks. It is debatable whether all the labour requirements of a complex industry could be recruited in an area which has no fishing tradition.

So far as the United Kingdom is concerned it would appear that the development of new fishing ports is unlikely. The solution seems to be to adapt existing facilities to meet the new requirements. This may not, however, be true in a country with a fishing industry at a lesser stage of development or without the same labour problems.

The Development of Synthetic Auction Boxes in the Federal Republic of Germany

by M. Hauke

Développement de l'emploi de recipients en materiaux synthetiques en République Fédérale d'Allemagne

La communication est consacrée aux tentatives de l'Office de commercialisation du poisson de mer de Cuxhaven pour mettre au point un bac amélioré pour la manutention dans la halle de vente. On s'est d'abord efforcé de perfectionner la caisse en bois traditionnelle en atténuant la porosité du matériau, pour produire ensuite des bacs en aluminium et en fibre de verre, mais les essais de ces types de contenants n'ont pas été satisfaisants étant donné les dures conditions d'emploi, notamment la manipulation par chariots élévateurs à fourche.

Avec l'apparition de nouveaux matériaux synthétiques, une nouvelle tentative a été faite en 1962 en ayant recours cette fois-ci au polyéthylène. Alors que les premiers bacs de polyéthylène avaient leur fond muni de barrettes en bois, le modèle actuel est moulé d'une seule pièce, avec des rainures destinées à permettre une bonne superposition. Les bacs, qui ont bien supporté un traitement particulièrement sévère, sont beaucoup plus légers que les récipients traditionnels. Il a été décidé de fournir ce type normalisé de bac polyéthylène à un centre qui desservira les quatre principaux marchés allemands du poisson de mer.

Adelantos en el empleo de cajas de material sintetico en la R.F. Alemana

En este trabajo se describen los esfuerzos hechos por la Campañía del Mercado de Pescado Marino de Cuxhaven para fabricar un nuevo tipo de cajas con destino al mercado de subastas. En un principio se realizaron pruebas para mejorar las cajas usuales de madera mediante una reducción de su porosidad, e igualmente con la construcción de cajas de aluminio y fibra de cristal, pero las pruebas hechas con éstas no dieron buenos resultados debido a lo difícil de su manipulación, incluido el empleo de camiones con horquilla elevadora.

En 1962, con la aparición de nuevos materiales sintéticos se trató otra vez de construir una caja de polietileno. Las cajas antiguas estaban provistas de deslizadores de madera, pero las actuales tienen unos tacos que evitan el movimiento horizontal. Estas cajas, además de ser muy resistentes, son mucho más ligeras que las usadas anteriormente. Un consorcio formado por los cuatro principales mercados de pescado marino de Alemania ha decidido utilizar este tipo uniformado de cajas de polietileno.

FOR better hygiene and appearance of wooden auction fish boxes used in this market since 1908, it was decided to make tests after treating their surface, or to replace them with boxes of another material.

The first tests, made in the early fifties, consisted of sealing the surface of the box with a special substance, but the experiment failed. Complete coatings of varnish and synthetic material were then tried, but these peeled off after a short time.

Early in 1956, we designed a new type of box and made a prototype from sheet metal. Using this specimen, the Niedersächsische Kunststoffwerke G.m.b.H. (Lower Saxony Plastics Works Ltd.) made 500 in glass-fibre reinforced polyester resin. These were used in November 1956, but tests showed that the glued bottom failed. The boxes were returned to the manufacturer, and early in January 1957, we received 50 boxes with riveted bottoms, but these too became unusable after several weeks' testing.

Simultaneously with these tests experiments were carried out with boxes of riveted sheet aluminium made by the Aluminium Works of Göttingen.

But these too, failed to withstand rough handling. Later, the Aluminium Works of Göttingen sent boxes of cast aluminium. They lasted much longer, but the noise factor of these was unbearable within the confines of the market.

Trials with imported models were also unsuccessful. When we used our well-tried method of pulling down a full box from a truck with three layers of boxes, several broke after only three tests.

During this period, fishery firms and forwarding agents were making increasing use of fork-lifts. Their forks caused further damage, in addition to the normal very heavy wear to which auction boxes are subjected. The development of yet more boxes came to a halt for some time. It was only after manufacturers found ways of producing polyethylene at a favourable price that this material was predominantly used in the manufacture of containers in the early sixties,

In 1962, we therefore resumed contact with Hüls Chemical Works and, after long discussions, designed a new box with the Kunststoff-Spritzwerke Hanning (Hanning Plastics Works). Polyethylene was used for this container, which according to the Hüls recipe, is designated "Vestolen A 18".

In February 1964, we received the first 3,000 Vestolen A 18 boxes. For technical reasons and to keep down costs, the boxes were equipped with wooden skids for this mass test. Each cost DM49.00 ($12), including wooden skids, fixing, and development costs.

As all our previous tests had been disappointing, and since we had to achieve quick results because of the new health law, we used these boxes daily, subjecting them to particularly rough handling. Despite strong misgivings and great scepticism, the container did not show the slightest damage or other defect after being used for several months.

Our workers quickly got used to the new box. The difference in weight was of decisive importance—a used wooden box weighs about 22 kg (48.2 lb) a polyethylene box only 7 kg (15.4 lb).

The smooth material had a slight drawback, as boxes slide sideways into one another during transport, and fish is crushed. Empty boxes frequently dropped from the lorry. But this was remedied by a slight alteration before the next 4,000 boxes were ordered. To prevent them slipping terminal bosses were added to the skids.

After the Cuxhaven sea-fish market had solved the difficult problem of cleaning the boxes, by developing and building a mobile washing machine, it was decided to equip the whole Cuxhaven market with this new type of box.

The conference of German sea-fish market companies adopted the Cuxhaven box for all four markets from 1 January 1968. The Cuxhaven and Bremerhaven markets are to receive 40.000 boxes each and the markets of Hamburg and Kiel 10.000 each. The administration of Cuxhaven fish market is in charge of this pool

Transport Planning and Distribution: The Total Cost Approach

by J. N. Bathurst

Planification des transports et distribution: methode du coût total

La communication esquisse les modifications que doivent subir concepts et méthodes lorsqu'on aborde certains problèmes relevant de la planification des transports et de la distribution. Elle énumère les éléments indispensables pour le bon fonctionnement de chaque moyen de transport, et étudie ensuite la manière dont tous les modes de transports doivent fusionner en un dispositif efficace et équilibré. L'auteur insiste en outre sur la nécessité, lorsqu'on veut mettre sur pied de nouveaux services ou installations, d'aborder le problème sous l'angle d'un "usager" polyvalent plutôt qu'unique.

La communication étudie le concept de la distribution totale du produit, du point de départ à sa destination finale, et illustre le rôle du transport par rapport aux huit principaux constituants d'un schéma complet de distribution, ainsi que les interactions entre ceux-ci.

L'auteur examine brièvement l'influence du concept de la distribution totale sur l'emplacement ou le choix du site de toute installation de transformation, en la rapprochant du rapport fret/valeur du produit, puis du rapport coût de la distribution/valeur du produit.

Il souligne les répercussions des derniers progrès technologiques sur la planification des transports, afin de faire ressortir la nécessité de considérer tous les moyens de transport comme faisant partie d'un tout, et non comme des éléments distincts. Il expose brièvement la fonction du transport en tant que "catalyseur" du processus de distribution, et fournit certains critères permettant d'évaluer, en fonction de la demande commerciale présente et future, la demande de services et d'installations en matière de transport. La communication renferme une étude succincte sur la diversité des facteurs liés à l'industrie halieutique et pouvant influer sur les décisions touchant l'organisation de tout moyen de transport ou de distribution qui s'y rattache. L'auteur recommande que chaque problème de commercialisation, compte tenu de ses conditions particulières, soit examiné séparément dans le cadre général de ces nouveaux concepts, en soulignant la nécessité d'aborder, chaque fois que cela est possible, le problème sous l'angle d'une utilisation "polyvalente".

Planificacion y distribución del transporte: estudio del costo tota

Este trabajo indica los cambios de concepto y métodos que se plantean cuando se estudian determinados problemas de planificación y distribución del transporte. Enumera los elementos esenciales para una buena utilización de cada forma de transporte, examinando a continuación cómo hay que integrar todas estas formas para obtener una sistema de transporte eficaz y equilibrado. Se pone también de relieve la necesidad de realizar un estudio teniendo en cuenta la posibilidad del empleo por diversos tipos de usuarios y no para uno solo de ellos, cuando se trata de introducir nuevos servicios e instalaciones.

Se examina el concepto de la distribución total del producto desde su origen inicial hasta su destino final; se ilustra la función del transporte en relación con los ocho componentes principales de un tipo total de distribución, así como la acción mutua entre tales componentes.

Se analiza brevemente el efecto del concepto de distribución total sobre el emplazamiento de las instalaciones de elaboración. Esto se conexiona igualmente con la relación entre el costo del transporte y el valor del producto, y entre los costos totales de la distribución y el valor del producto.

Se exponen los efectos de los últimos adelantos tecnológicos sobre la planificación del transporte, con objeto de poner de relieve la necesidad de observar todos las formas de transporte en cuanto parte de un sistema integrado y no como formas individuales. Se indica la función del transporte como catalizador del proceso de distribución y se exponen algunos criterios segùn los cuales la demanda de servicios y medios de transporte se puede analizar en función de la demanda actual y futura del mercado. El trabajo termina con un breve examen de los diversos factores asociados con la industria pesquera que pueden influir en las decisiones al planificar cualesquiera medios de transporte y distribución que tengan relación con ella. Recomienda que cada problema particular de comercialización junto con sus propias y específicas circunstancias, se examine separadamente dentro del contexto general de los nuevos conceptos analizados, haciendo resaltar la necesidad de un enfoque orientado al empleo por diversos usuarios siempre que ello sea posible.

THIS paper will highlight some basic problems which arise when new demands are created for transport services and facilities and which require the establishment of new services and facilities or the expansion and/or adjustment of those already in existence. As such, the paper will not concern itself directly with the specific subjects of the Conference on Fishing Ports and Port Markets, but rather, it will attempt to show the importance of the total cost approach in transport planning, be it for the handling and distribution of fish, agricultural produce, manufactured goods, industrial products or raw materials. It is desired to emphasize the usage of the words "handling and distribution" used in the previous sentence because it is the efficient "distribution" of product that is the ultimate objective of transport planning, and as such all the many factors which contribute to the achievement of a final and optimum solution must be taken into account.

The changing concept

In the past there has always been a tendency to regard each mode of transport as a separate or distinct entity, and usually each has been designed and organized to provide a service over and within a given area; to operate solely between terminals, with perhaps stops in between to load or off-load goods and/or passengers. What may be termed the long-range or line-haul operator or carrier usually has been chiefly concerned with providing this type of service. Particularly in the case of sea and air transport, operators tend to think only of depositing the cargo or passengers at their terminals. The ultimate destination of these goods or passengers has rarely been of any concern to them. This traditional terminal to terminal concept, and the regarding of each separate transport mode as an entity in itself, have been obstacles to the development of effective systems of total through movement of people and cargo, particularly within metropolitan urban areas.

However, there is now an ever growing recognition, particularly insofar as the movement of goods is concerned, that transport systems must be designed with an eye to the "total cost of distribution" and to facilitating the complete "through (inter-modal) movement" of goods and people. Thus "distribution", as such, is different and much more embracing than "transport".

Transport essentially comprises three main elements or modes, land (road and rail), maritime (ocean, coastal and inland waterway), and air. There is a fourth which can perhaps best be classified as "transmission lines" (electric power grid systems, oil and gas pipelines, together with the rapidly developing technology in the transmission of solids and slurry, etc., by pipeline).

It is only on very rare occasions that the movement of goods or people, from point of origin to final destination is accomplished without having to use two or more of these elements or modes. Thus, the efficiency of any transport network is dependent, not only on the individual efficiency of each mode—be it land, maritime, or air, but also to a major extent, on the proper integration of each with the other. Such integration is of paramount importance at the "interface" or transfer points among or between each mode such as the air and sea ports, fishing harbours, truck depots and rail yards. It must be remembered, however, that the achievement of maximum integration between the land, maritime and air transport modes for a balanced and efficient transport system is complicated.

ELEMENTS OF TRANSPORT

The successful operation of each mode in itself requires the co-ordination of a complex amalgam of elements involving many skills and fields of expertise. For instance, consideration must be given to the following main aspects:

(a) economic and financial
(b) organization and administration
(c) planning and programming
(d) operational functioning
(e) design, construction, maintenance and repair of vehicles (ships, barges, aircraft, cars, trucks, locomotives, rolling stock, etc.)
(f) design, construction, maintenance and repair of fixed installations (roads, rail tracks, air and sea ports, bridges, tunnels, communications and control equipment, etc.)
(g) design, construction, maintenance and repair of cargo and other materials handling equipment (cranes, fork lifts, tractors, containers, etc.)
(h) regulatory and legal.

Last, but by no means least, every consideration must be given to the personnel requirements for the creation, operation and maintenance of this vast and intricate complex such as:

(i) management, both administrative and operational
(j) research, both economic and technical
(k) labour, for construction, operation and maintenance.

Each of the foregoing elements, whether applied to a single transport mode, or as part of an integrated transport system, is completely inter-dependent, and any change or imbalance in one, must ultimately have a chain reaction effect throughout the whole of the complicated system.

Need for multi-purpose approach

It should also be borne in mind that transport does—and always will—play an essential and dominant role in all sectors of economic and social life. Each sector of any economic and social structure, be it industry, manufacture, agriculture, mining, lumber, tourism—is dependent for its efficient and unimpeded functioning and growth, on transport in some form or other. Thus it is essential that transport be developed in such a manner that it does not become the prerogative of any one sector to the detriment of another. Especially since modern transport methods are capital intensive, every effort must be made to insure against any unnecessary "unilateral" development for the benefit of any one sector or requirement, unless such "unilateral" accomplishment has sufficient economic justification within the overall balanced general infrastructure. When expansion of existing facilities, the development of new facilities, or introduction of new techniques are being considered, a "multi-purpose" approach must be taken in order to minimize investment and maximize utilization.

At the present time, we are in the midst of tremendous scientific and technological developments which are both causing and making possible a total or radical change in a great many of the traditional transport methods and techniques. The next decade is going to see even greater revolutionary changes as some of this new technology develops beyond its embryonic and prototype stages. These new technologies and methodologies are making possible and bringing about increasing interactions between the various transport modes, and it is becoming increasingly difficult to deal with any one mode (road, rail, ocean, coastwise and inland waterway shipping, or air), or the "interfaces" (ports, yards and depots) as separate entities without taking due recognition of the complicated inter-relationships that exist among them. A high degree of integration is required for the optimum economic distribution of goods and commodities.

The "total distribution" concept

To achieve this result, a comprehensive "distribution" pattern must be sought, among the eight principal components—transport, packaging, warehousing and storage, inventory, purchasing, insurance, documentation and a communications system in participating in the logistic functions.

Table I. A distribution matrix†
Affected elements

Distribution Elements	*Transportation*	*Warehousing*	*Inventory Control*	*Product Packaging*	*Purchasing*	*Insurance*	*Documentation*	*Communication*
Transportation		*	*	*	*	*	*	*
Warehousing	*		*	*	*	*	X	*
Inventory Control	*	*		*	*	*	X	X
Product Packaging	*	*	*		X	X	O	O
Purchasing	*	*	*	X		X	X	O
Insurance	*	*	X	*	X		X	O
Documentation	*	X	O	O	X	X		O
Communication	*	*	*	O	X	O	O	

† Aaron Gellman, *Handling and Shipping*, November 1967.
* Important action upon the above.
X Possible action upon the above.
O Little or no action on the above.

A matrix which illustrates the interaction between these major elements of a distribution system is given in Table I. This matrix, it must be remembered, is applicable to the logistic aspects for maintaining an adequate supply of a "finished" product to the final vendor, whether this be (a) a raw material or produce to a manufacturer or processing plant, (b) for the distribution of such raw material or produce direct to a final vendor, or (c) a processed or manufactured product from plant to vendor.

The correct physical distribution decisions are those which minimize the total cost of the enterprise. It is at once obvious that the degree of skill required to reach the proper decisions is higher when distribution principles govern than when the transport segment operates alone, as can be seen in the distribution matrix which sets forth the general relationships between the major elements of the distribution process.

The matrix is constructed to show the degree of interaction in the other elements of distribution when a decision is taken in any one element. The active (affecting) elements are shown in the left-hand vertical column; the elements affected are arranged across the top.

Several features of this matrix are worthy of mention. First, transportation decisions interact with all other components of the distribution process and they in turn interact with transportation in each case. The top row and the left column are filled with important action elements. The lower right portion of the matrix displays mostly "possible" and "little or no action". This reflects the more influential character of the first of the elements listed in the matrix.

This matrix assumes that the nature of the product or produce for distribution is finalized or fixed. Unfortunately this need not always be the case, and very often we are faced with produce which needs whole or partial processing somewhere between its point of "initial" origin and its final destination (usually the consumer). Furthermore it may well be that certain produce is marketable in its original or raw state and also in a processed state, and therefore the demand of the consumer in the area where it is to be finally marketed will also be a determining factor.

EFFECT ON LOCATION OF PROCESSING FACILITIES

These are elements which can have a fundamental effect on the requirement for transport services and facilities. Similarly the type, availability of, or changes in, any existing transport services and facilities can have an equal, if reverse, effect which raises a number of major problems: for instance, if total or partial processing of produce is required, where along the route from initial origin to consumer should this take place? Such a decision will be predicated on a vast number of considerations outside the scope of this paper, but the transport element in particular, together with the other factors listed in the matrix above will undoubtedly be major contributing factors.

There are many examples that can be quoted, all of which serve to support a simple fundamental requirement insofar as the purely transport aspect is concerned, i.e., the need for a "multi-purpose" approach in order to achieve the maximum utilization of capability and/or capacity in existing or planned transport services and facilities. Illustrative is a situation which may well develop in Eastern Malaysia. This region has traditionally exported timber in log form because the conventional break-bulk type of shipping services available could readily handle this type of cargo effectively and cheaply. However, with the advent of the various unit load systems, it appears now that the imports to the area will be more effectively transported in containers—**provided** suitable return cargoes can be found. This has immediately led to an examination of the possibility for the local partial processing of the logs into parquet blocks, veneers, plywoods, etc., which would then make these timber exports suitable for being transported in containers. Thus a change in transport capability can have very considerable side effects—the creation of new local industries, the increase in value of the exported product brought about by local processing, and quite probably, because of this increase in value, a reduction in the "ratio of freight cost to commodity value".

Incidentally, the "ratio of freight cost to commodity value" factor is also one which needs some very close examination, particularly when any form of processing to achieve a final product is involved. There are many instances where the complete or partial processing of a product at source will add value and reduce the capacity needed for its transportation. Furthermore, if there are any marketable by-products arising from the processing of a raw material it should be borne in mind that the ultimate destinations of these and the main product will probably be totally different. Of course there are other factors such as cost and availability of labour, power, water and so on, which must also be given due consideration but as this paper is primarily oriented to transport and not plant location they are outside its scope.

Freight and distribution costs

Before leaving this topic of "ratio of freight cost to commodity value", it is perhaps as well to re-iterate once more the underlying concept of the "total cost of distribution" because freight costs as such are only one of the elements which must be considered. Ultimately, to arrive at the best possible solution, it is necessary to achieve a proper balance and optimize on all the elements affecting the total distribution pattern as given in the matrix (Table 1). Thus the end result that must be sought is the lowest possible "ratio of **total distribution** costs to commodity value".

EFFECT OF NEW TECHNOLOGIES IN TRANSPORT

There are many avenues to be explored connected with the various elements that make up the total distribution complex. Not least of these is the advent of new technologies in transport, materials, handling and packaging techniques. Some of these, particularly insofar as perishables are concerned, are having a most profound effect on (a) the need for, or type of processing required and (b) in enabling such commodities to be distributed and marketed profitably in areas hitherto considered inaccessible. Foremost amongst these new technologies are perhaps those of the "controlled atmosphere" and "refrigerator" or "reefer" containers. Also of equal importance is the ever growing network and capability in air freight. In some instances, the actual transport costs may well be higher when these new technologies are utilized, but other costs such as packaging, insurance and warehousing may well be reduced to such an extent that the overall "total cost of distribution" itself is reduced. Thus these new developments in transport technology may probably result in a twofold benefit, first in enabling existing distribution cost to be lowered, and second, in widening the market for products, thereby bringing about an increase in demand. It is therefore essential that every element of the distribution matrix be thoroughly, and continuously explored so that the impact and interaction of any new technologies or methodologies achieved in any one element, may be duly recognized and its ultimate effect on the total overall distribution pattern properly assessed.

TRANSPORT: A CATALYST IN DISTRIBUTION

Recognizing that this paper has tended to stress the need for an overall total distribution approach to the problem rather than an elemental approach confined specifically to transport, it does become necessary at this stage, however, to refer more specifically to this main catalyst in the distribution pattern—transport—which permits the markets to be reached. In doing so, however, the reader is asked to bear continuously in mind that the transport element is only one of the eight major factors affecting or affected by the total distribution requirement.

Perhaps the best manner in which this can be achieved is to outline some of the criteria by which the demand for transport services and facilities can be tested in terms of present and future market projections. In doing this, there are in effect two main questions to which answers must be sought, both of which break down into a number of more detailed issues as outlined below:

(a) What is the market demand for (i) type of product, and (ii) in what volume?
(b) Does this demand for product type necessitate processing or can the product be marketed in its natural state?
(c) If processing is needed, is there a market for any by-products and if so where is this located and for what volume?
(d) Are the products perishable or non-perishable?
(e) What is the size and type of market, i.e., town, city, regional, national or international?
(f) What are the marketable values of the products and how much transport (distribution) costs can they bear to remain both profitable and competitive?

What transport is needed?

(a) What transport facilities and services already exist, i.e., mode, type, capacity and condition, etc.?
(b) Can it be utilized in reaching the desired market efficiently, i.e., for products in either a natural state or processed condition?
(c) What is the effect of the existing transport capability on the need for and/or siting of processing facilities?
(d) Is there any requirement for product redistribution, either before or after any processing procedures or in its natural state?
(e) Are existing transport capabilities sufficient, as to capacity and type of service offered; if not are they capable of adaptation or should the establishment of new services be considered?
(f) What side benefits would accrue from new services, i.e., can they be utilized effectively for other purposes; for instance, can a new fishing harbour also be used by other shipping services; are there return or reverse flows of cargoes available from market areas, etc.?
(g) What are the relative locations and distances involved between initial origin and final market?
(h) Is the demand balanced or is it seasonal, thereby creating transport "peaks"?

(i) What are the relative merits of the various modes of transport when related to the total distribution requirement?

RELATIONSHIP TO FISHING INDUSTRY

It was stated in the Introduction that this paper would not concern itself directly with the problem of fishing ports and port markets, because the underlying and basic principles concerning the transport and distribution of fish are in no way different from those which must be applied to any other product. The important factor is that these basic principles be fully realized and applied correctly to the specific circumstances pertaining to the type of product and marketing conditions.

One of the reasons for this approach has been the impossibility of finding what may be termed a typical set of conditions to apply to the marketing of a product that can come in so many varied forms as fish and, moreover, one which can be marketed in so many different forms. Ranging from one extreme to the other, we have the completely unsophisticated "over the beach" or very small fishing village type of operation where the local boats land their catches for marketing to the local population of a very small area, up to the highly sophisticated "mother" or "factory" ship concept where the catches from a fleet of fishing vessels are processed and fully prepared for marketing prior to its return to port. In between, we have a multitudinous variety of operations covering a very broad spectrum such as, for instance, the medium to large size fishing port with or without its own processing plants where fishing vessels will land their catches direct for wholesale distribution to a major city and urban area, or for redistribution to other inland areas; the complex distribution problems for the marketing of fresh or frozen delicacy items such as frozen lobster tails or shrimp by air freight; the canning industry aspect which can cover all types of fish product such as crab, lobster, shrimp, tuna, salmon, herring; and so on. Not mentioned in the foregoing is another exceedingly important aspect, that of the processing and marketing of the numerous and valuable by-products.

Thus the problem of distribution, insofar as transport is concerned, is very complex and varied, ranging from the air freighting of fresh or frozen high market value items for a luxury market to the conveyance by land or water of what might be termed the basic staple types of fish, but which still require special handling as perishables, to the canned product with a long storage life which can in effect be handled and transported as any other general freight or cargo.

No absolute answer

It will be seen therefore that with so many variables it is impossible to lay down any hard and fast rules—there are no **absolute** answers in transport—each set of circumstances must be judged on its own merits and the basic principles applied to ensure the achievement of the lowest possible ratio of total distribution costs to commodity value.

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The Systems Approach to Fishing Port Planning

by A. Anctil

Methode des systèmes pour la planification des ports de pêche

Les ports de pêche et les marchés portuaires d'un pays doivent être considérés comme faisant partie d'un système unique, à savoir l'industrie des pêches de ce pays. De récentes améliorations apportées à l'industrie halieutique intéressent le développement technique d'éléments et de sous-systèmes tels que bateaux de pêche et transformation des produits de la pêche, mais on a accordé peu d'attention aux interactions entre ce développement et d'autres constituants du système. Ces innovations ne seront tout à fait fructueuses que lorsque les éléments considérés et le milieu dans lequel ils opèrent auront été intégrés en tenant compte de toutes les possibilités analytiques qu'offre la méthode des systèmes.

Les techniques de simulation automatique constituent un instrument très précieux pour étudier les effets des innovations sur la performance globale du système, et conviennent généralement aux systèmes comportant un certain nombre d'opérations, d'activités et de fonctions présentant des interrelations complexes. Puisque les ports de pêche répondent aux critères de complexité susmentionnés, les techniques de simulation pourraient être utilisées pour résoudre des problèmes tels que la comparaison des avantages matériels et économiques de différentes structures et règles de fonctionnement.

Quatre constituants fondamentaux du modèle couvrent pleinement toutes les situations pouvant se présenter dans un port de pêche: installations matérielles du port, trafic portuaire, règles de fonctionnement, et caractéristiques de performance des éléments actifs du port.

Pour conclure, en temps qu'instrument analytique de gestion, la simulation ne se limite pas aux problèmes des ports de pêche, mai pourrait également être utile aux organismes d'Etat s'occupant de la planification et de la réglementation du secteur général des pêches et aux compagnies de pêches privées.

Estudio sobre sistemas de diseño de puertos pesqueros

Los puertos pesqueros y los mercados portuarios de un país se deben considerar como parte de un solo sistema constituido por la industria pesquera nacional. Las recientes mejoras en esta última han correspondido al desarrollo tecnológico de los componentes de subsistemas tales como las embarcaciones pesqueras y la elaboración del pescado, pero se ha prestado poca atención a los efectos recíprocos de dicho desarrollo con otros elementos del sistema. Dichas mejoras sólo producirán todas sus ventajas cuando estos componentes y los medios ambientes del sistema en que operan se hayan integrado basándose en la completa potencia analítica del estudio del sistema.

Las técnicas de reproducción de las condiciones naturales con calculadoras electrónicas constituyen un instrumento muy valioso para estudiar los efectos de las mejoras sobre el funcionamiento de todo el sistema, siendo generalmente adecuadas para sistemas que abarcan varias operaciones, actividades y funciones, con complejas relaciones mutuas del sistema. Los puertos pesqueros satisfacen los criterios mencionados de complejidad y por ello las técnicas de reproducción artificial de las condiciones podrían usarse para resolver problemas tales como la comparación del funcionamiento físico y económico de otros modelos de puertos y formas de operación de ellos.

Cuatro partes básicas del modelo imitador de la condiciones naturales describen completamente cualquier situación del problema relacionada con un puerto pesquero. Estas partes son: diseño material del puerto, tráfico en el puerto, normas de operación portuarias y características de la actuación de los elementos que operan en el puerto.

Como conclusión, en cuanto instrumento de ordenación analítica, la reproducción imitativa de las condiciones naturales no se limita a los problemas portuarios y pesqueros sino que también puede ser útil para los organismos gubernamentales que se ocupan de la planificación y regulación del conjunto de la industria pesquera y para las compañías de pesca privadas.

DURING this conference will be identified and discussed some of the problems facing fishing ports and port markets. That there exists such a diversity of viewpoints as to the nature of these problems will cause no surprise. The fishing industry comprises many different interests and activities, each with its own problems, management objectives and needs for solution. And, in the economy with which I am familiar—free enterprise—it is to be expected that each facet of the industry will attempt to solve its own problems and to reach operational efficiency according to its own standards.

On the other hand, this very segmentation certainly contributes to many of the industry's current ailments. What has evolved through the years in many countries is a patchwork of individual and sometimes competitive fishing infrastructures, operating managements, and government regulatory bodies. This condition is a direct result of nations' past fragmental approaches to their fishing industry problem, a history of specific actions, addressed to specific problems at specific times, and supported by inconsistent and often obsolete legislation and regulation policies.

It is quite important that we view the variety of tasks associated within fishing ports and port markets as being part of a single system which is the fishing industry.

Under present circumstances, a "system approach" must face various difficulties because of the segmentation of the industry and the main imbalances, limiting interactions, and arbitrary and discriminatory constraints which presently affect the fishing industry operations in general. Because the separate activities associated with the movement and handling of fish or fish processed cargoes were neither initially conceived, nor currently operated, as a system, the question remains as to how and by what method they can be viewed as component elements of a single system.

The systems approach

In many sectors of the economy, recent improvements have been primarily in technological development of components and subsystems. This is more so in the fishing industry where new technological developments have occurred, first in the gathering of fish, second in the design of fishing boats, third in the processing of fish, its distribution and marketing systems. Relatively little attention has been given to the complex interactions of such developments with other system elements and within systems as a whole. As a result, when the new developments have been integrated into actual system operations they have frequently only partially realized their potential benefits. Expected overall improvements in operating efficiencies and cost have been partly negated by system imbalances that resulted in costly congestion, reduced utilization, and logistics bottlenecks.

As a consequence, the systems approach has developed in recent years. It is a general method by which individual components of a system are analyzed as parts of a total or integrated system, with full consideration given to the many and complex system inter-relationships and interactions.

However, two basic difficulties arise when considering the systems approach in the solution of fish transportation problems and more specifically the system approach to fishing ports planning and port markets. First is the definition of the system problems. Second is the selection of a suitable analytical tool to use in studying it.

With regard to problem definition, there is the question "What system" or perhaps "Which system" or "Whose system". Considering any aggregation of fragmented and separate transportation modes, facilities, equipment and subsystems as an integrated system is practicable only when system interrelationships exist. It is necessary to identify the limits of a system. In this context, the total aggregation of the fish industry of a nation or of a region can be considered as a system. Examples of other systems include:

(a) the local transportation network involved primarily in the movement of fish products
(b) the individual railroad carrier with its many interchanges
(c) the combination of transportation and process activities which carry a fish from its catch area to a fishing port, then through an unloading and transformation process and finally by some mode of transportation to local or distant destination
(d) the combined operations and activities that handle packaged fish through transportation and distribution links from a transformation and manufacturing plant to delivery at retail establishments.

Because of the wide diversity and heterogeneity of systems used in the fishing industry from the search process to the delivery at retail establishments there is a major difficulty in selecting the proper tools for system analysis. Although numerous analytical tools have been developed for study of any transportation network, system, cost, rate, and so forth, they have, for the most part, been concerned with specific problems within specific modes. These do not satisfy the need for a method of analysis which can be applied across-the-board to the large number of diverse problems concerning large networks and systems, such as a nationwide fish catching and distribution system, involving complex transformation and process operations, mixes of modes, that is from fishing vessels to truck or train and numerous subsystems.

Lacking such tools for integrated systems analysis, there will continue to be strong imbalances between technological development of components on one hand and, on the other, the developments of integrated systems capable of utilizing these improvements in the most efficient manner. Recent improvements in the fishing industry, such as, new search and catching methods, new fishing boats, new fish processes such as Fish Protein Concentrate (FPC) will yield their full advantage only when these components and the system environments in which they operate have been integrated on the basis of the full analytical power of the system approach.

THE COMPUTER SIMULATION APPROACH

Advances in computer technology have focused increasing attention on the utilization of computer-based systems analysis techniques, particularly computer simulation. The reasons underlying increased use of computer simulation are basic to an understanding of its application as an analytical tool.

Conventional systems analysis is based on the use of system "models" which are abstract representations of real life systems. These models permit the analyst to study and to experiment with the system by operating and manipulating its model instead of the actual system, which in most cases would be impracticable. Until recently there has been widespread dependence on the use of "mathematical models". These are mathematical relationships describing the operations of the real-life system. However, in a large number of instances, mathematical tools have been inadequate to represent complex system interrelationships and variables with sufficient accuracy. They have involved, by necessity, many abstractions, approximations, simplifications and assumptions, all of which reduced the precision of the results, in some cases to the point of being invalid.

Computer simulation techniques avoid such difficulties. A replica of a real system situation in the form of computer simulation can be as precise as the ability of the analyst to provide the necessary description of the system situation. The only limits are not those of the analytical tool, but rather the availability of data and the analyst's understanding of the details of the system. The computer simulator is a highly valuable tool for experimentation with alternative system policies, procedures, rules, facilities, equipment and designs. If the analyst were to conduct such experiments with the real system, the alternatives and changes would have to be made to the actual equipment and operating procedures. Then the actual systems configurations, as modified, would each have to be operated over a period of time. Resulting performance would have to be measured by some appropriate means and compared in order to determine the effects of changes on overall system performance.

This is exactly the manner in which computer simulation is used for systems analysis, but under controlled conditions, with no system disruption and at only a small fraction of the cost and time. Alternatives are investigated by making computer runs with different system configurations. Comparison of the computer output data for each of these alternatives provides the measures for evaluation of the effects of changes on simulated systems and on their performance.

The usefulness of computer simulation, like any other systems analysis tool, depends on an adequate understanding of the problem situation and the operating peculiarities of the system under study. This need to identify and understand the details of individual operations and their system interrelationships has, in itself, proven to be one of the most useful features of computer simulation. Often, formulating a problem has forced the analyst to develop new insight regarding system operating characteristics. Some solutions then become obvious without further formal analysis and computer processing.

Application of simulation to fishing ports

A simulation is generally suitable for systems problems that are concerned with a number of operations, activities and functions, with complex system interrelationships for which suitable mathematical analysis techniques are not available. Specifically, system problem situation may be characterized by:

(a) large and complex networks comprising heterogeneous combinations of modes, equipment, facilities and operating rules

(b) system traffic consisting of different types of traffic units (trucks, train, vessels, pumps, messages, paperwork, shipments, etc.) flowing through the system at varying traffic levels

(c) definable system operating rules related to routing, dispatch, work assignment, work schedules and so forth

(d) system element performance and interactions which to some degree are characterized by randomness, and which can result in delays, congestion, and inefficient utilization of the system resources in facilities, equipment and manpower.

Fishing ports meet the above mentioned criteria of complexity and simulation could therefore be used to solve problems such as:

(e) comparison of physical and economic performance of alternative fishing port configurations and operating rules. Management may be interested in determining the best alternative among several competitive choices, such as the establishment of one major fishing port or many small ports along a coastline to serve local and inland markets. A simulation analysis is used in a manner similar to experimentation with an actual system. First a simulation model is developed, the validity of which can be tested against the actual port system. Then alternative proposals are simulated, with the outputs considered as valid examples of what would happen if these changes were made in the actual system. Specific transportation system features which may be analyzed, either separately or in combination, include but are not limited to: facility and equipment; facility location; equipment and facility design features; manpower and equipment assignments; packaging and handling schemes; schedules and routes; dispatch, operating, and routing rules; terminal and fish handling equipment layout

(f) identification of fishing port imbalances causing congestion, reduced productivity, and increased costs

(g) development of design and performance criteria for increased fishing port efficiency.

The simulation model of a fishing port is essentially a computer program that simulates the behaviour of operational elements of what is referred to in operations research as waiting line or queuing system network. Each operational element contains provision for:

(h) holding traffic units in a queue while awaiting service

(i) performing the service for a traffic unit

(j) breaking down traffic units into sub-units or consolidating sub-units into larger traffic units

(k) accumulating traffic units in delay when either service is interrupted or units cannot depart from an element upon completion of service.

For analysis, networks are structured by arranging individual operational elements according to their system interrelationships. In fishing ports, the operational elements represent a railroad classification yard, a motor truck haul, a fork lift transfer operation, and so on.

Input data

There are four basic parts to the input data set, which together fully describe any problem situation related to a fishing port. They are: port physical plant, port traffic, port operating rules, and performance characteristics of the port operating elements.

Because the simulation output can be no more precise or representative of the real situation than the input, one of the initial steps is to determine the degree of precision required in the input data. Where there is a lack of supporting data, sensitivity analyses can be made to determine the relative importance of the different port parameters in influencing the overall port performance. The simulation model can be designed to accept input data at all levels of precision and to permit upgrading of data during the course of a problem run.

Port physical plant

The physical plant input defines the boundaries of the fishing port whose elements are to be included in the analysis. For example, the boundaries might be coincident with the geographical, political, system, facility or other limits which encompass the particular port elements under study.

The physical plant input also identifies each of these elements and their network arrangements. This information is developed with the aid of a descriptive model. The descriptive model is essentially the road map of the flow of the port traffic. Individual traffic units will follow along certain of these paths in accordance with specific routing

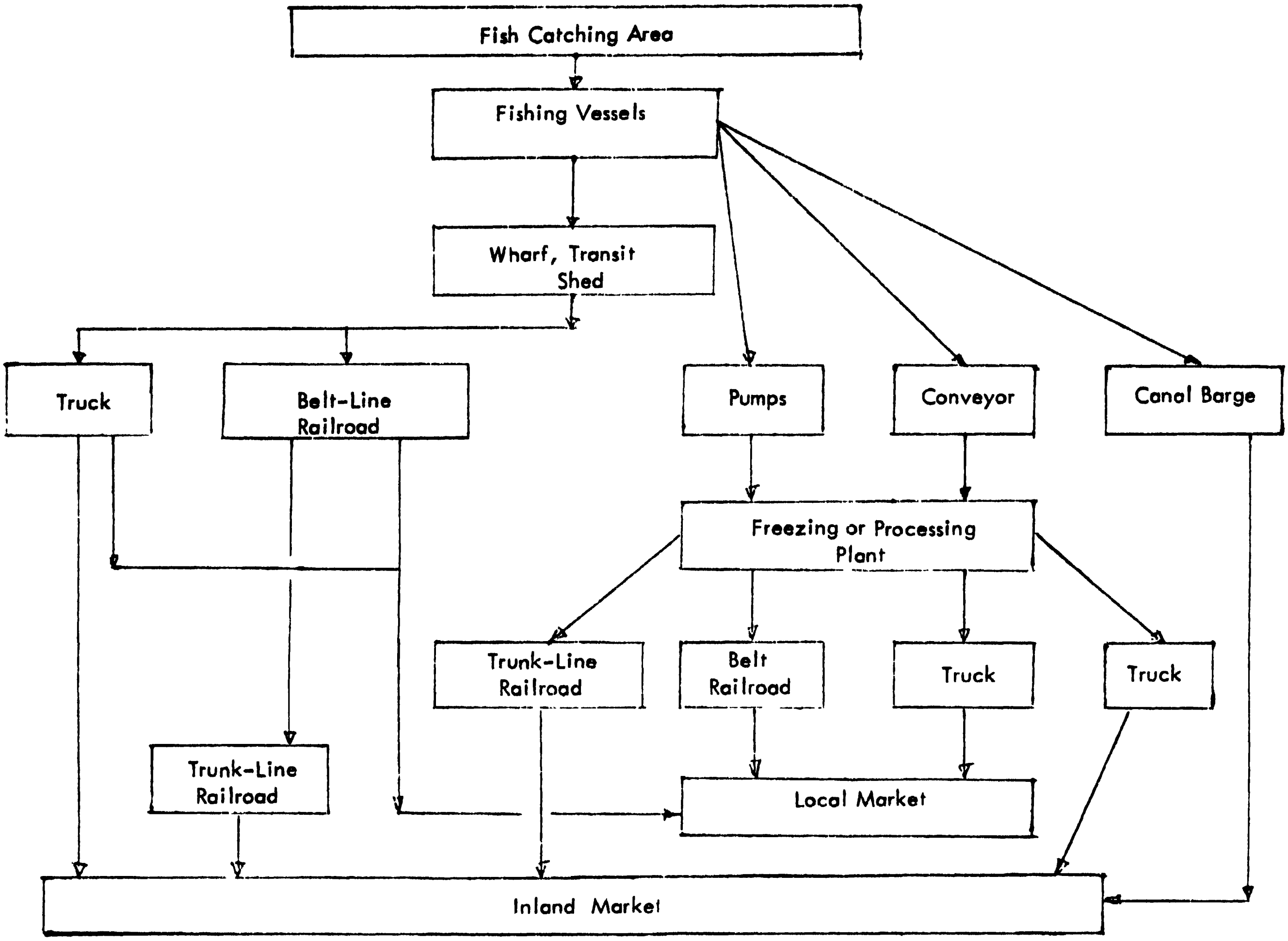


Fig 1. Schematic of some possible inbound cargo flows in a fishing port

rules, which are included in another part of the input data set, under Port Operating Rules.

Figure 1 is a flow sheet illustrating a typical fishing port complex, including highway and rail nets, railroad, transit sheds, transfer equipment, berths and fishing vessels. Typical fishing port situations might comprise all or some of these elements in different numbers and arrangements. The descriptive model provides the basic system layout for the next step in development of the simulation model for the fishing port: the schematic simulation model.

The schematic simulation model identifies in detail each of the operational elements which are to be considered in the network of the computer simulation model and also their detailed arrangement in the network. This model also provides the framework to assist in the collection and processing of data and the routing of port traffic. The structuring of the schematic model requires that each individual element be represented at the level of detail compatible with the requirements of the analysis. For example, according to the end use of the output, a fishing vessel terminal can be represented as a single operational element, or can be broken down into its component operations, such as unloading, sorting, accumulating, etc.

Port traffic

Another part of the input data set is the information defining the port traffic flowing through the specified physical plant. Port traffic is described in terms of traffic units such as transport units, transfer units or shipment units. Transport units might be rail trains or cars, motor trucks, barges, coastal fishing vessels and high-sea fishing vessels. Transfer units include conveyors, pumps, cranes, men, etc. Shipment units include fish or other cargoes in different package forms such as palletized loads, unitized loads, break-bulk shipments, etc.

The simulation model will have the ability to process traffic consisting of mixes of any of the traffic unit types and to break down or consolidate traffic units at any point during movement through the port. The continuity of flow of a given traffic volume has to be preserved despite the several conversions of traffic units, which might take place during transit throughout interchange. The selection of the specific traffic unit to be used at any particular point depends upon several factors such as the nature and complexity of the problem, the availability of input data, the end use of the output, and the available computer capacity for conducting transactions at different levels of detail.

Port traffic levels will be defined in terms of origination of traffic units at the systems boundaries or at sources within the boundaries. Originations may be as a fixed schedule, schedule-oriented with random early and late originations, or completely random in accordance with some probability distribution.

Port rules, performance and output

In the real world, all systems function under sets of operating rules, whether formalized or otherwise, which govern operating decisions such as routing, work or equipment assignments and schedules, and dispatching. In the simulation model, these rules, as they actually exist in the port under study, will be used as inputs and processed into logic and decision rules.

Each of the operating elements of the physical plant exhibits certain performance characteristics when servicing a traffic unit. It is essential that these characteristics be used as input to the simulation. Because historical or empirical data describing performance of elements of real systems are normally either nonexistent or very difficult and costly to obtain, the simulation model will be designed to accept input data from sources such as estimates from operating personnel, empirical data from historical records and field sampling studies and so on.

The model will then simulate the physical flow of traffic through a fishing port. Accordingly, the output of the computer simulation will describe the physical performance of the port and its components, as measured in terms of traffic levels and capacities, transit times, delays, utilization of facilities, equipment and manpower, and other performance parameters, as required for the planning or any other particular problems.

The simulation output will be initially in two standard output formats, the standard Event Log and the Summary Report, which are sufficient to cover the majority of applications. The Event Log presents a detailed chronological record of all events occurring during the simulation run. The Summary Report presents the summarized performance statistics for each of the operational elements in the port, cumulated from the start of the simulation run.

CONCLUSION

On the basis of my presentation, I trust that I have satisfactorily demonstrated that simulation can be a useful analytical tool for application to fishing port problems. However, as an analytical management tool, simulation is not limited to the fishing port alone. Government agencies concerned with the planning and regulation of the overall fishing industry will find simulation to be a useful analytical tool for:

(a) evaluation of alternative technological developments in order to provide guidelines for government investment planning and policy
(b) establishing the effects on performance and costs of different regulatory measures.

Privately owned fishing companies could also use simulation to experiment with alternative courses, and conduct comparative analyses prior to making decision. Transportation managers within these companies will find simulation particularly suited to:

(c) evaluation of alternatives proposed changes to the physical plant, which may include alternative location, capacities, and performance capabilities of facilities and equipment
(d) evaluation of alternative routes on a route-profitability basis
(e) evaluation of effects on total system performance and costs, of changes in operating rules, schedules, work and equipment assignments, maintenance and repair policy, and the like
(f) maximizing utilization of facilities, equipment and manpower by eliminating congestion, bottlenecks and system imbalances.

DISCUSSION

THE PLANNING OF PROCESSING AND TRANSPORTATION FACILITIES

Gifford (UK—Chairman) said, from the papers, it should be quite clear from the old advice to the port engineer that you must make your port fit the ship was no longer sufficient; port and ship must now form part of a complete and complex system of transportation from the actual point of catching to delivering the final product to the consumer. This included transport from fishing grounds to harbour, landing, marketing; even the actual method of selling, processing and final delivery. These processes as the papers showed, had to be subdivided. Although design of the ship was outside the scope of the session, there should always be close liaison between ship designer and port designer; the matter of unloading had already been touched upon. Similarly, the effect of methods of transport from fishing grounds would affect the port concept, such as the use of mother ships or fast carriers. Unloading methods must form part of the transportation chain and be considered by the port designer. The method of transporting fish from quay-side into the market and from market to the processing or delivery point was of great importance.

Pollution problem

Cormack (Canada) speaking of matters relating to processing plants, raised the question of water pollution from effluent discharged from plants. As this problem was an international one, he would be pleased to hear from engineers present of any method which could eliminate this nuisance, at a relatively small cost. Sea water was preferable for fluming purposes in the plant instead of using fresh water—this for technical and economic reasons, if water had to be purchased from a municipal source.

Osborn (UK) said there were three possibilities of eliminating this problem:

(a) Complete treatment of sewage so that clean water was discharged—but this was costly.
(b) Disposal of effluent offshore if its concentration was not high and could be dispersed.
(c) Disposal of effluent of high concentration some distance offshore, in deep water, to ensure adequate dispersion. The use of plastic pipes in this type of outfall was a cheap form of construction.

He said that full treatment of effluent was obviously preferable particularly in industrial countries which discharged large quantities.

Whiteford (UK) on the question of water supply to and effluent from processing plants, stated that if salt water was polluted, fresh water or purified salt water must be used. He said that return of effluent would not significantly affect already-polluted sea water. Otherwise the long pipe disposal method, with unpolluted sea water used for processing, mentioned by the previous speaker, could be used. He remarked that the fish processing plants themselves were responsible for much of the pollution of sea water in the vicinity of fish harbours.

Treating effluent

Cox (UK) said that this was a problem influenced by the organization of the industry, in that different solutions might be required if the processing works were near the market or if they were dispersed throughout an old town. In the first case all effluent could be collected and discharged to a central treatment plant or to the town sewer. In the second case disposal of effluent in a safe hygienic manner might present serious problems. As the participants had seen in Bremerhaven the day before, all the processing plants were concentrated near the port market and it would be interesting to hear from a Bremerhaven delegate about their experience in this respect and also from other participants where processing plants were dispersed from the market.

Hauke (Federal Republic of Germany) spoke of experience gained in Cuxhaven. In planning the port and effluent disposal they had tried to effect some centralization of waste from factories but had, unfortunately, found that the effluent of the city and of the port at peak hours was too much for the existing installations. Whenever new installations were made it had also been very difficult to extend the channelling system further. In Cuxhaven the problem was, as elsewhere, that the cleaning of the effluent could be done but that it all depended on financial factors because there were different approaches to the problem. For instance, as seen from the point of view of the municipality as opposed to the administration of the harbour. Sometimes a ceiling was set because of technical considerations, and on the other hand there was the problem of finance. He mentioned pre-cleaning of effluent at source by using special equipment, sluices and locks, but was of the opinion that this method was not yet technically perfect.

Methods in France

Lafouge (France) said the problem of evacuating sewage in industrial ports, was very important. The solution was either to lead the effluent far out at sea, but this was very expensive because of the piping involved, or to bring waste to a purifying plant which had been done in Boulogne-sur-mer, but again this was very expensive. In Boulogne the effluent was brought to the same purification plant as the one used for town sewage but the effluent from ports was so great that it was necessary to construct a special purifying plant, equivalent to a town of 100,000 inhabitants. Pre-purifying of sewage before discharge into the town mains was the answer.

Guckian (FAO) said that air pollution from fishmeal plants was another important question and he would like to hear views on this matter.

Harrison (FAO) stated this topic was on the agenda of the International Association of Fish Meal Manufacturers meeting in Bremen the following week. It was under constant review by the Association's Technical Committee. Effective methods had been worked out but they cost money and their use was related to the noxious problem they created. Most methods involved controlled circulation of air from processing equipment and burning of the draw-off air in the plant boiler or by other means.

Smell from meal factories

Hauke (Federal Republic of Germany) mentioned that in Cuxhaven there were three fishmeal factories and the smell was appalling. To eliminate this, factory chimney stacks had been lengthened up to 80 m, and it was now hoped that at least the smell would not descend right around the factory or the port, but about 10 km outside the town. The odours from transport of fresh and other fish in the fishing ports were particularly unpleasant. This was notable in Cuxhaven, it was a sort of spa with a beach, and a fishing town. The town, of course, did not want visitors bothered by the smell from the fishing port. He had found similar conditions in French and Belgian resorts. The solution in Cuxhaven was to put a big poster outside the town stating that the visitor was now entering a fishing port and that it also was a resort. He thought there was very little possibility of finding a really inexpensive solution to the problem.

Goldet (France) pointed out that electric fork-lift trucks although very expensive cut down pollution of fish by diesel fumes. He would like to know if any of the United States participants could say more about fork lift trucks, in particular, the costs of L.P.G. (Liquid Propane Gas) trucks as he believed these would be very cheap to run and would not cause pollution.

Dopplinger (Canada) said that he could not give any information on costs but confirmed that no offensive gases were given off when using L.P.G.

Petrol and diesel fumes

Marchal (France) said that air pollution in fishing ports by engine exhausts was being studied in all great French cities, especially in Paris where the pollution rate was very high. A study group had been set up to cut down pollution and would be reporting soon. A new carburetter system had been tried out in the United States and the results were so outstanding that it was hoped in a few years' time that such a carburetter system would prevent pollution, not only in fishing ports but in all urban areas.

Hopper (UK) said that lift trucks of all types could be hired from plant hire contractors for as little as $2 per hour, including a driver. This was a cheap way of obtaining fork-lift truck capacity as and when required.

Norman (UK) mentioned that a review of fish transportation within the fish market area at one large English port included the movement of fish sent from other ports by motor lorry to the rear of the selling space. The fish were moved after the auctions by means of low-loading Lister diesel platform trucks which had continuously running engines which exhausted into the atmosphere around the vehicle and its load thus causing air pollution of the fish to some degree.

Guckian (FAO) described the situation in the Philippines in which the best site for a new fishing port for Manila had a particularly difficult problem. The harbour area was dominated by the city's main refuse dump into which 900,000 tons were dumped each year. This meant a dredging task of immense magnitude. In addition, the sewage from Manila was discharged into the river near the site of the new fishing port, heavily contaminating the water. It would be years before a suitable disposal plant could be developed and in the meantime the port had to be built.

New packaging method

Lyon (USA) described a new packaging system for wet fish in the USA. With the elimination of passenger train services, the small shippers of fresh fish had encountered problems in moving their products. A non-drip insulated pack was being developed which could be used by bus lines and airlines to transport fresh fish. These packs used either fibre or plastic and contained an interior plastic lining. At present research was being carried out to determine if the bus lines and airlines would use the packs, and what their comparative costs would be.

Dopplinger (Canada) said that to reduce time spent on board a vessel for gear repair and to reduce the time of vessel turn-around in port they had in Canada been considering the provision of central net maintenance services on-shore. This would enable a vessel to take a number of trawls from the central depot and rather than mend torn trawls, switch to a new trawl after damage. Upon returning, the torn trawls could be exchanged at the central net loft and be repaired there rather than on board where it would waste fishing time. This was only in the planning stage and no practical action had been taken to date.

Fulham (USA) pointed out that it was now possible to move ice considerable distances by air flow. In Tampa, Florida, ice was moved about 300 feet. This automatically manufactured ice was frozen on plates to a thickness of $\frac{5}{8}$ in to $\frac{3}{4}$ in. It was then fragmented and sorted at about 20°F. He mentioned another installation of this type called "Turbo Ice" where ice could be delivered by air at an angle of 40° at a rate of 50 tons per hour. The manufacturer of the ice had said that he could deliver ice up to a height of 40 ft at 25 tons per hour at an angle of 80°.

SESSION XI

Roles of the Government and Private Enterprise in Fishing Port Development in Japan

by G. Seo and S. Kimura

Roles respectifs des pouvoirs publics et du secteur privé dans le développement des ports de pêche au Japon

Les auteurs décrivent la structure de l'industrie japonaise des pêches et l'évolution qu'elle a connue depuis la fin des hostilités, en mentionnant également la géographie du pays. Ils exposent les aléas de la situation halieutique et étudient les types de ports de pêche nécessaires.

Après avoir traité du rôle joué par le pouvoir central dans la création d'un réseau national de ports de pêche, les auteurs examinent les divers types de ports de pêche et leurs installations, s'attachant aux responsabilités en matière de construction et d'entretien des différentes catégories de ports, et notamment au rôle du gouvernement central et des gouvernements locaux dans la construction et l'entretien des ports de pêche. Les questions de la protection du littoral, des transports et des secours en cas de catastrophes naturelles sont également étudiées en fonction du réseau des ports de pêche. La communication passe en revue les attributions des services chargés de la gestion des ports de pêche.

Les auteurs expliquent que, sous la direction d'ensemble du Ministère de l'agriculture et des forêts, tant les autorités locales que les entreprises privées interviennent dans la gestion des ports de pêche et dans leur développement. Ils étudient le rôle du secteur privé dans la mise en place de diverses installations, et exposent les raisons qui militent en faveur des subventions publiques pour les travaux portuaires.

Les auteurs concluent que gouvernement central, autorités locales et secteur privé ont tous un rôle à jouer dans la planification du développement des ports, que leurs responsabilités précises évoluent continuellement avec les conditions économiques, et que la situation doit donc être suivie de près.

Funciones del gobierno y de la industria privada en la construcción y funcionamento de los puertos pesqueros en el Japón

Este estudio describe la estructura de la industria pesquera en el Japón y su evolución desde la guerra, llamando también la atención acerca de la situación geográfica del país. Describe los riesgos naturales de la situación de la pesca, y examina las clases de puertos pesqueros que se necesitan.

Se describen las responsabilidades del gobierno central en el desarrollo de un sistema nacional de puertos pesqueros, y se consideran los distintos tipos de puertos pesqueros y sus instalaciones y servicios. Se examinan a continuación las responsabilidades relacionadas con el aprovisionamiento y conservación de los diferentes tipos de puertos y, en especial, las funciones del gobierno central y de los gobiernos locales a tal respecto. Se examinan también cuestiones de protección costera, de transporte, y de ayuda en casos de desastres, en relación con el sistema de los puertos pesqueros. Se indican las obligaciones de las autoridades administrativas de dichos puertos.

Se explica que, bajo la dirección general de planificación del Ministerio de Agricultura y Montes, tanto las autoridades locales como las empresas privadas se hallan implicadas en la administración de los puertos pesqueros y en su desarrollo futuro. Se examina la función que desempeña la empresa privada en la provisión de instalaciones y servicios, y se indica cuando está justificado el subvencionamiento de las obras portuarias por el Estado.

El estudio llega a la conclusión de que tanto los gobiernos centrales y locales como las empresas privadas, tienen funciones necesarias que desempeñar en la planificación del desarrollo portuario, pero que sus responsabilidades concretas cambian continuamente al variar las circunstancias económicas, por lo que la situación debe examinarse continuamento.

IT is considered that the roles of the Central and local governments, and of private enterprise in fishing port development, differ according to natural geographical circumstances as well as to the industrial and economic situation of the nation. In Japan, where fisheries have been one of the principal industries from ancient times on account both of her natural geographical circumstances as well as her industrial and economic condition, keen interest has been taken by the Central and local governments and private enterprise in the development of fishing ports which are indispensable for a sound fishing industry.

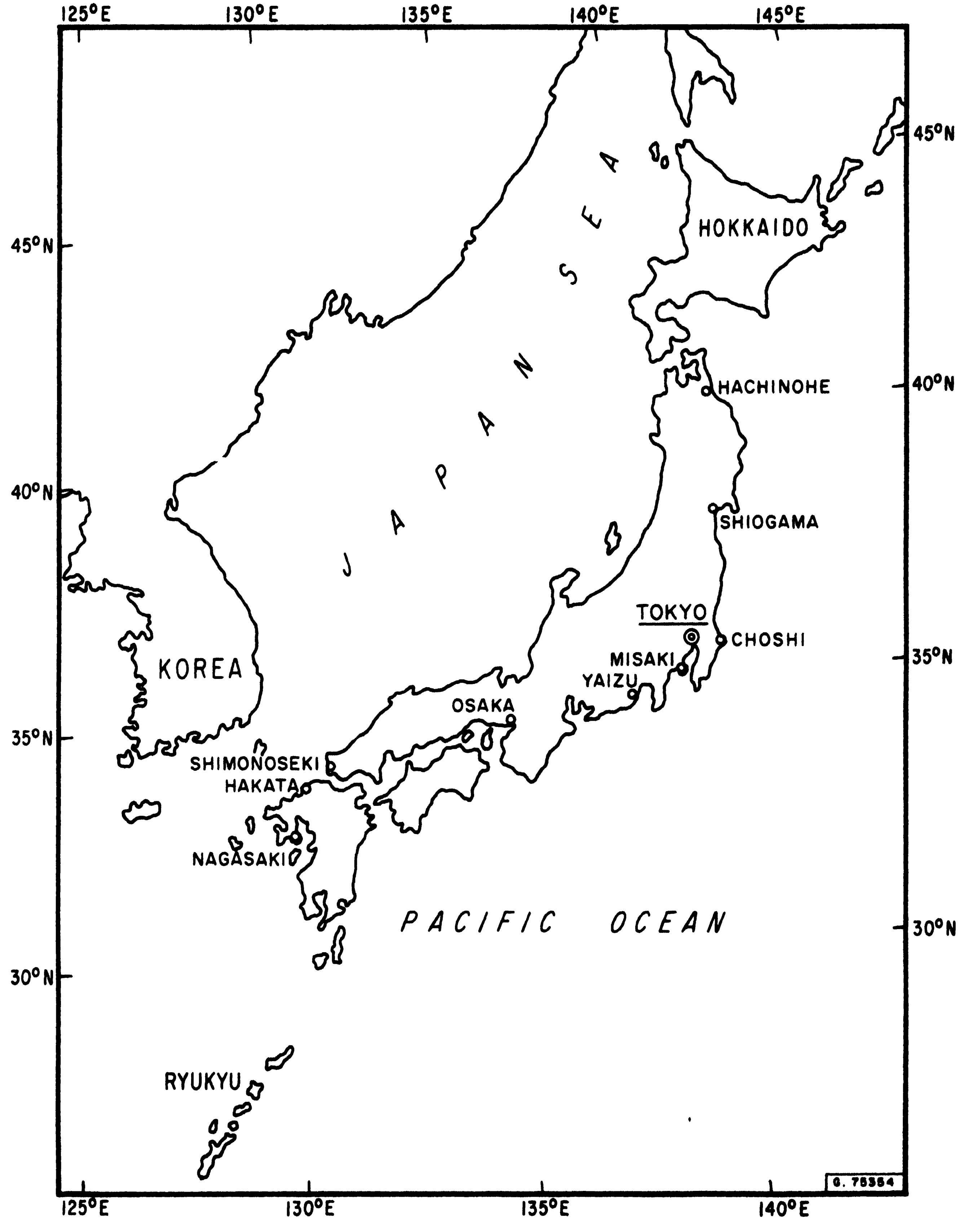
This paper outlines, in the first place, the present condition of fishing ports in Japan, and then describes the respective roles of the Central and local governments and private enterprise, in the two important problems of vital importance for the development of fisheries, the construction, and the management, of fishing ports, in accordance with the fishery situation.

Historical sketch of fishing ports development

Japan consists of the four major islands of Honshu, lying in the centre, Hokkaido in the north, Shikoku and Kyushu in the south and many, small islands numbering about 3,300 in all. The archipelago of Japan stretches in a slender arc, the northernmost point being 45°30′ of north latitude, while the southernmost is at 29° of north latitude. Her topography is mountainous with few plains, the length of shoreline (approximately 27,000 km (16,000 mi) being very long compared with her area—approximately 370,000 square kilometers (143,000 square miles).

Moreover, Japan is situated at the meeting point of Asia, the largest continent, and the Pacific Ocean, also the largest of oceans. The mixing of warm and cold currents along her coastline provides rich fishing grounds. Many of her people depend on fisheries, and fishery products are the chief source of animal protein foods to the Japanese. Fisheries, therefore, have been one of the principal industries from ancient times. Under such circumstances, the appropriate construction and repair of fishing ports, as well as their maintenance and management, are very important problems.

When fisheries were in their infancy, fishermen used the natural inlets as their bases of operations. As fisheries developed, breakwaters and mooring facilities, etc., came to be constructed artificially.


125°E
130°E
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40°N
35°N
30°N
JAPAN SEA
HOKKAIDO
HACHINOHE
SHIOGAMA
TOKYO
CHOSHI
MISAKI
YAIZU
OSAKA
KOREA
SHIMONOSEKI
HAKATA
NAGASAKI
PACIFIC OCEAN
RYUKYU
G. 75364

Fig 1. Japan

Those facilities, in the beginning, had been constructed by the fishermen themselves. Since the closing years of the nineteenth century, however, when fishing boats were modernized and became larger, larger fishing port facilities came to be required and the expense necessary for the construction of such structures was too much for fishermen to bear.

In 1908, the Central Government for the first time gave financial assistance to local governments for constructing fishing ports. Since then, the Central Government has continued to encourage fishing port developments through the necessary assistance. During World War II, such works were entirely suspended, and, as a result, fishing port facilities became dilapidated.

Foodstuff shortages posed a keen problem in Japan after the war, and the recovery of fisheries came to be regarded with high priority. The construction of fishing ports thus became urgent and the government started reconstruction.

With the economic recovery of Japan, the fishing fleet has greatly increased, both in numbers and size of vessels and has exceeded pre-war level.

Further, following changes in the social situation, the fishing port administrations needed to be improved and a fundamental policy was necessary, so the enactment of the fishing port law, which should be the basis of the fishing port administration, came to be very necessary. Finally in 1950 the Fishing Port Law was established. The main purpose of this Law is to provide efficient fishing ports and to provide for their proper maintenance and management, to facilitate the development of fisheries, stabilize the national life and advance the national economy.

Definition of a fishing port

As there are many fishermen's hamlets in Japan, so there are also a great many ports[*]. By the Fishing Port Law, a fishing port is defined as a composition of water area, land area and facilities to be used as a natural or artificial fishing base, which is so designated by the Minister of Agriculture and Forestry[†] by deciding its name, type and area, after consultation with the Fishing Port Council,[‡] and after hearing the opinion of the governor of the prefecture concerned. The fishing ports referred to later in this paper are those designated under the Fishing Port Law.

Fishing ports are classified into the following four types according to their scope of utilization and the features of their fisheries:

Type 1 fishing port. A small fishing port whose utilization is chiefly limited to the fisheries in its local districts.

Type 2 fishing port. A fishing port of medium scale whose utilization is broader than Type 1 fishing port, but more narrow than Type 3 fishing port, (i.e. a fishing port that is mostly utilized by fishing vessels operating solely in a prefecture)

Type 3 fishing port. A big fishing port whose utilization is nation-wide

Type 4 fishing port. A fishing port which is located in an isolated area or any other remote place, and is indispensable for the exploitation of fishing grounds or as shelter for fishing boats.

Of Type 3 fishing ports, those which are specially important for fisheries development are called Specific Type 3 fishing ports, and are determined by Cabinet Order. They are the representative fishing ports in Japan, and there are eight in all; Hachinoche, Shiogama, Choshi, Misaki, Yaizu, Shimonoseki, Hakata and Nagasaki (see fig 1).

In designating fishing ports, the Minister of Agriculture and Forestry determines the name, type and area (water area and land area) in accordance with the provisions of the Fishing Port Law. Since it is a basically important item of fishing port administration, it is required that the Minister of Agriculture and Forestry consult with the Fishing Port Council, and after hearing the opinion of the governor of prefecture concerned, confers with the competent Minister (the Minister of Transportation) who is in charge of the general administration of ports and harbours, with regard to the area of fishing ports. When the area of a fishing port overlaps with the area of rivers to which the Rivers Law applies, or overlaps with a coast protection area based upon the Coast Law, the consultatation shall be made with Rivers Administrator concerned (thė Minister of Construction or the governor of prefecture) or with the Coast Administrator concerned.

The number of designated fishing ports as of 31 March 1968 is as tabulated below:

Type 1 fishing port	2,201
Type 2 fishing port	409
Type 3 fishing port	94
Type 4 fishing port	74
	2,778

Classification of fishing port facilities

As it is necessary to classify fishing port facilities in order to carry out proper maintenance and management, as well as the repair and construction of fishing ports, fishing port facilities are classified under the Fishing Port Law as follows:

(a) Basic facilities
  (i) Breakwaters, sand-groins, tide embankments, training walls, sluices, locks, revetments, levees, jetties and sea-shore levees
  (ii) Mooring facilities: wharves, landing places, mooring buoys, bollards, piers, floating piers and slipways
  (iii) Water facilities: routes and basins

(b) Functional facilities
  (i) Transportation facilities: railways, tramways, roads, bridges and canals

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[*] Of the ports utilized by fishing boats in Japan, the majority are fishing ports under the Fishing Port Law, and ports and harbours based upon the Ports and Harbours Law. Besides these, there are, though small in number, also ports which do not come under the above-mentioned two Laws.

[†] The fishing ports administrations in Japan are under the jurisdiction of the Fisheries Agency, of the Ministry of Agriculture and Forestry as the central administrative organization of the State.

[‡] The Fishing Port Council is a consultative body, attached to the Ministry of Agriculture and Forestry, which is engaged in research and deliberation on important items concerning fishing ports, under the supervision of the Minister of Agriculture and Forestry.

(ii) Navigation facilities: navigation aids, signal facilities and lighting facilities for communications for entry and clearance of fishing fleets
(iii) Land for fishing port facilities: sites for all kinds of fishing port facilities
(iv) Preservation facilities for fishing fleets and gear: fishing fleet repairing yards, fishing fleet engine repairing yards and fishing gear drying grounds
(v) Supply facilities: water supply and oil supply facilities for fishing fleets
(vi) Fish catch handling, preserving and processing facilities: selling places, cranes, fishing products warehouses, open yards, ice-making, refrigerating and ice storing facilities and processing plants
(vii) Fisheries communication facilities: wireless telegraph stations on land, wireless telephone stations and meteorological signal stations on land
(viii) Crew members' welfare facilities: lodgings, bathhouses, medical offices and halls
(ix) Fishing port management facilities: offices and watch stations.

Among the above-mentioned, all basic facilities and transportation facilities and land for fishing port facilities become eligible for subsidy payments by serving the public purpose.

MAINTENANCE AND MANAGEMENT OF FISHING PORTS

Since the maintenance and management of fishing ports are indispensable for carrying out their role as production bases for fisheries development, it is necessary to establish responsibility for maintenance and management. For this purpose, the Minister of Agriculture and Forestry designates the local governments in whose area a fishing port is located, as the fishing port management body who carries out proper maintenance and management of the fishing port.

The Minister of Agriculture and Forestry, when designating a fishing port management body, does so according to the standard determined after consultation with the Fishing Port Council and upon hearing the opinion of the governor of the prefecture concerned. When it is deemed that a fishing management body fails to properly carry out the maintenance and management of a fishing port, or is unsuitable as a fishing port management body, the designation thereof may be cancelled after holding a public hearing. The status of designation of a fishing port management body by prefecture and city, town or village separately, as of 31 March 1968 is as shown in Table 1. The cases in which a prefecture is the fishing port management body amount to 24 per cent of the total number of fishing port management bodies, while the cases in which city, town or village is the management body, amount to 76 per cent of the whole.

TABLE 1. STATUS OF DESIGNATION OF FISHING PORT MANAGEMENT

	Prefecture	*City, town or village*	*Total*
Type 1 fishing port	278	1,923	2,201
Type 2 fishing port	229	180	409
Type 3 fishing port	89	5	94
Type 4 fishing port	74	—	74
Total	670	2,108	2,77

The business carried out by a fishing port management body is as mentioned hereunder:

(a) To establish fishing port management regulations, and to carry out maintenance and management of a fishing port in accordance with the above regulations
(b) A fishing port management body for a Type 3 fishing port is obliged to set up a fishing port management committee, and fishing port management bodies of fishing ports other than Type 3 may set up fishing port management committees
(c) To carry out study and research, as well as the preparation of statistical data necessary for the fishing port development
(d) To carry out the fishing port repair and construction work and disaster restoration work, etc., of the fishing port facilities
(e) To prepare a fishing port register concerning the fishing port under its management
(f) In cases when the coast protection area based upon the Coast Law overlaps the fishing port area, the fishing port management body is charged with the responsibility of coast protection for its area in the capacity of coast management body
(g) The fishing port management body may charge for use of the services provided by rentals, fees, occupancy rates, etc., from the users of fishing ports, in conformity with the provisions of fishing port management regulations, in order to provide for expenses incurred for the maintenance and control of a fishing port.

CONSTRUCTION WORK BY CENTRAL AND LOCAL GOVERNMENTS

Based upon the Fishing Port Law, and various other laws and regulations, the Central Government has the duty to lead and control the fishing port administration by local governments which are fishing port management bodies, and also to determine the planning of fishing port development.

In accordance with the plan, the Central Government itself executes fishing port repair and construction works of Type 3 and 4 fishing ports in Hokkaido, while local governments execute other fishing port repair and construction work as well as general harbour repair and construction and disaster restoration work. The Central Government subsidizes a part of the expenses of work carried out by these local governments, the rate of subsidy being between thirty and one hundred per cent of the total expenses. The actual performance of these works, may be directly carried out by the Central or local governments or may be contracted out to private constructors.

The Central Government subsidizes a part of the expense of repair and construction work of fishing ports, and the principal reasons for this are given below:

(a) The fisheries in Japan play an important rôle in supplying animal protein food, which is necessary for the nation, and the demand for fishery products is increasing annually. So it is the basic policy of the state to increase the production of fishery products.

(b) In the fisheries structure of Japan, the production by coastal fishing (which refers to the fishing by fishing boats of ten gross tons or less, and by fishermen consisting primarily of family labour) amounts to about one third of the total fisheries production. The majority of the fishery manpower is engaged in this form of fisheries, but the business scale as well as the capital involved is insignificant, resulting in low productivity. Further, as their income is on an exceedingly low level as compared with that of those engaged in secondary or tertiary industry, it is deemed necessary to improve their productivity and standard of living.

(c) Japan suffers from the violence of typhoons originating in the South Pacific from summer to autumn each year, and in the winter, is swept by strong winds and raging waves caused by the high atmospheric pressure of the Asian continent. It also falls a victim to frequently occurring earthquakes. From the geographical point of view, the rias coast makes for very narrow basins and a deep sea bed, and drifting sand often silts ports on sandy beach areas. As a result, it is frequently very expensive to repair and construct fishing ports, and it is impossible to carry out repair and construction work of fishing port facilities at the expense of fishermen alone.

Planning and building fishing ports

It is of primary importance in developing fisheries, to repair and construct fishing ports adapted to meet changes. So it is established that the Minister of Agriculture and Forestry determines the planning of fishing ports after consulting the Fishing Port Council, and, upon a decision by the Cabinet presents proposals to the Diet for approval. Further, the Cabinet is obliged to appropriate the necessary sums in the budget for executing the planned development each year. The facilities to be repaired and constructed by the development plan are those facilities under public ownership. The first plan of fishing port development was called the Primary Fishing Port Plan, and was passed in 1951. Afterwards, it was revised, and in 1955 a Second Fishing Port Plan was established. In accordance with this plan, its execution extended to 1962.

Since that year, because in common with the intense growth of the Japanese economy, development in the fishery situation has been greater than was estimated at the time of the establishment of the Second Plan, it became clear that the plan then existing was inadequate. So the Third Fishing Port Plan was established in 1963, taking into account the present as well as the future status of fisheries.

In this planning, the 1970's target of fisheries production and fishing boats in all Japan was estimated, and the location of ports was selected. For these, individual plans were properly determined, taking into consideration their fishing ground conditions, their natural and geographical conditions, and their priorities in construction. The construction work carried out by the plan is generally on a large scale. Besides the above, there are a few provisions to construct necessary facilities flexibly in response to changes in the fishery situation, though their works are, on the whole, medium or small in scale. Further, since 1965, in order to develop fishing port functions, and to modernize fisheries production by rationalization of distribution of the fish catch and the transportation of fishery materials, and, at the same time, to improve fishing village environments, fishing port road works have been constructed to connect a port to a main highway or to a principal port.

The outline of public works mentioned above from 1963 to 1967 is shown in Table 2.

TABLE 2. OUTLINE OF EXECUTION OF PUBLIC WORKS FROM 1963 TO 1967

Classification	*Expenditures* 1,000 US$	*Period*
Construction works carried out by the plan of fishing port development	135,158	From 1963 to 1967
Improvement works of medium or small scale	62,900	From 1963 to 1967
Coastal protection works in fishing ports	33,633	From 1963 to 1967
Road construction works	8,258	From 1965 to 1967
Total	239,949	

Coastal protection works in fishing ports

The length of the coast line of Japan is approximately 27,000 km (16,000 mi) and is very long in comparison with the national area. The length of coast line within the fishing port areas extends to 5,551 km (2,730 mi), occupying 20.5 per cent of the entire length. Fishing ports are dotted everywhere along the coast line, and since in the area surrounding the fishing port various fisheries production activities are carried out, it is indispensable to protect the coast from disaster inflicted by tidal waves, flood tides or storm waves.

In 1956, the Coast Law was enacted, under which the Minister of Agriculture and Forestry has under his jurisdiction the coastal protection responsibility in fishing port areas, while the local governments, who are the fishing port management bodies are to control the area as coastal management bodies.

The coast management body executes coast protection works, constructing the defences against immersion by sea-water or erosion, such as revetments, jetties and seashore levees located in the designated coastal protection area.

Disaster restoration works

Fishing port facilities have suffered considerable damage from typhoons, or wind waves in winter, and a large provision is required for such disaster restoration works, affecting local finances to a great extent. As a result, the Central Government, as well as bearing a part of the expense, takes such necessary measures as providing public loan funds, thereby assisting the prevention of disaster, and, at the same time, planning to secure public welfare and national stability.

MANAGEMENT OF FACILITIES BY PRIVATE ENTERPRISE

Private bodies and private enterprise engage in fishery production facilities on land on a commercial basis, making the activities in the fishing port more integrated. The construction expenses of these facilities are normally financed by private funds. However, there are systems by which the Central or local governments may subsidize or finance construction expenses of some facilities.

Objects for subsidy are: fishery communication facilities, fishing boats and gear repair facilities, supply facilities, fish sheds, warehouses, icemaking, refrigerating and cold-storage facilities, and processing plants, etc.

Private bodies and private enterprises themselves manage the facilities so constructed.

The above mentioned facilities have played an important role in the distribution of the fish catch. In Japan where almost all of the catch is consumed as food, preservation of freshness is of primary importance. Therefore, in a district where fish such as cuttle fish or mackerel are landed in great abundance seasonally, the construction of such facilities are especially needed. When the big fishing ports and the small ones in Japan are compared, comparatively many facilities are provided in the former by private enterprises, performing fishing port functions efficiently.

In consideration of this, it must be admitted that the role of private enterprise for fishing port development is of great importance.

CONCLUSION

In the above we have considered the roles of the Central and local governments, and of private enterprise in fishing port development in Japan, and it is our view that these roles change and are modified according to the economic circumstances of the time and the fisheries and food situation, and they are not unchanging ones. However, it is considered that, as regards the repair and construction of basic facilities and of functional facilities which require an expensive initial investment, yet which are less profitable and involve great public concern, the Central and local governments should play a big role. But for the repair and construction of functional facilities on land which are commercially viable, private enterprise should play its part and both sides, together, should contribute to fishing port development. From now on, it is our hope that, closely watching the trend of many fishery situations and local fishing ports, we shall proceed to further study concerning the roles played by the Central and local governments as well as by private enterprise, according to the needs of the situation.

The Planning Role of Governmental Authorities and Private Industry in United Kingdom Fishing Ports

*by U.K. Ministries**

Le rôle des autorités de l'état et du secteur privé dans le développement des ports de pêche du Royaume-Uni

Si, dans maints pays en voie de développement, le système d'administration et de direction des ports forme un tout cohérent, le dispositif actuellement en vigueur au Royaume-Uni s'est constitué petit à petit au cours de nombreuses années et offre une grande diversité pour ce qui est des services responsables. Sur les apports totaux de produits de la mer au Royaume-Uni, évalués à £61 millions ($ E.-U. 146 millions), 78 pour 100 sont mis à terre dans 11 grands ports, 16 pour 100 dans 37 ports secondaires, et les autres 6 pour 100 dans 300 petits ports disséminés sur le littoral. Quatre grands ports d'angleterre et du Pays de Galles et un grand port d'Ecosse appartiennent au British Transport Docks Board, successeur des compagnies de chemin de fer indépendantes qui ont créé les ports et ont été nationalisées en 1947. Deux autres grands ports sont gérés par des autorités locales, et un par une société privée. Trois importants ports écossais sont exploités par des organismes autonomes institués par une loi spéciale. Le régime de propriété des ports locaux est extrêmement varié, mais près de la moitié sont administrés par les autorités locales, et une proportion analogue par des commissions portuaires ou des "trustees" (administrateurs).

La función de las autoridades del estado y de la industria privada en la planificación de los puertos pesqueros en el Reino Unido

Aunque en muchos países en desarrollo los sistemas de administración y control de los puertos están bastante integrados, en el Reino Unido el sistema actual se ha establecido a lo largo de muchos años e incluye una considerable diversidad de autoridades de control. De los desembarques totales de pescado en el Reino Unido, que se valoran en 61 millones de libras esterlinas (146 millones de dólares), el 78 por ciento se desembarca en 11 puertos principales, el 16 port ciento en 37 puertos de menor importancia y el 6 por ciento restante en 300 puertos más pesqueños y en fondeaderos de todas las costas. La "British Transport Docks Board", que es la sucesora de las compañías ferroviarias independientes que crearon los puertos, y que fueron nacionalizadas en 1947, posee 4 puertos principales en Inglaterra y Gales y uno en Escocia. Otros dos puertos principales son dirigidos por autoridades locales, y otro por una compañía particular. Tres importantes puertos escoceses están administrados por organismos particulares reconocidos por la ley. La propiedad de los puertos locales varía mucho, pero cerca de la mitad son administrados por autoridades locales y un nùmero similar por comisiones y organismos fiduciarios portuarios.

UNLIKE many developing countries the system of harbour administration and control in the United Kingdom has grown up over a long period of time and in a diverse fashion. Various changes in the functions of the fishing industry have led to some ports becoming redundant and this paper discusses the present system of harbour administration in the United Kingdom.

Fish valued at £61 million ($146 million) is landed. annually in the United Kingdom. £48 million ($115 million (78 per cent)) is landed at 11 main ports. £10 million ($24 million (16.0 per cent)) at 37 minor ports and the remaining £3 million ($7 million (6.0 per cent)) at some 300 small ports and havens spread all round the coasts (see Appendix).

Controlling authorities

Of the main ports, four in England and Wales, and one in Scotland, are owned and operated by the British Transport Docks Board. Two ports, one Scottish and one English, are owned and operated by local authorities. Three Scottish ports are operated by independent statutory authorities and one English port by a private docks company.

The minor ports are owned and operated as follows:

Local Authorities	15
Harbour Commissions and Trustees	16
British Transport Docks Board	1
Railways Board	1
Crown Commission	1
Private Company	2
Shipping Company (part private, part state)	1
	37

The ownership of the smaller ports is equally diverse.

It will be seen that there has been little uniformity in the ownership of fishing harbours, which has developed haphazardly over a long period. Harbour authorities at present can be grouped into four broad classes.

British Transport Docks Board

The Board is the successor to the British Transport Commission which in turn was preceded by the various independent railway companies. The ports were developed and owned by the railway companies and they now include some of the most important commercial ports in the United Kingdom. Railway ports were of particular significance to the fishing industry. Most fish was at one time distributed from the landing ports throughout the

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* Ministry of Agriculture, Fisheries and Food. Department of Agriculture and Fisheries for Scotland. Ministry of Agriculture for Northern Ireland.

United Kingdom by rail. The railways were able to run services right up to the dockside and this led to a near monopoly of fish transport for any distance beyond the local shops. The decline in railway prosperity which led to nationalization in 1947 also led to the companies' ports being absorbed into the British Commission. In 1962 continued financial problems led to all the 25 ports operated by the Commission being separated off and put under the control of the British Transport Docks Board Amongst these were the fishing ports of Hull, Grimsby (and Immingham), Lowestoft, Fleetwood, Ayr, Swansea, Hartlepool and Silloth.

The financial circumstances of the fish docks at these ports in 1962 when the Board took over, were bad. They have since improved considerably under a policy of efficient management, more economic charges and improved working. A great deal remains to be done by way of capital development to improve facilities, particularly to handle the growing fleet of freezer trawlers, and the Board has a programme of capital development up to 1972 involving expenditure of over £2½ million ($6 million). Part of these capital funds will be provided by the central government.

The improvement of facilities at these main ports is likely to continue although there will be some further changes in control and management for some of them when the Government policy of extended nationalization of all the large ports in the United Kingdom is implemented. Already there have been major re-organizations of harbour control on the Rivers Forth, Tyne, Tees and Humber which have affected fishing ports. In due course most of the larger fishing ports will come under the authority of the new Regional Port Authorities.

Local authority ports

Local authorities are responsible for operating many fishing ports. These include three of the main ports, *viz*. North Shields, Granton and Buckie, 14 of the more important minor ports, and many of the small ports. The authorities are the owners of the docks and facilities and usually provide the staff to manage and operate them. The fact that fish docks have not generally been profitable has probably been the cause of local authority involvement. In many cases, they have powers to make up deficits in annual harbour revenue from the rates but despite this the poor financial return at fishing harbours has not enabled them to accumulate sufficient capital to finance from their own resources the much needed improvement of old inefficient facilities.

Harbour commissions and trustees

Harbour commissions are responsible for 14 of the minor fishing ports and a number of the smaller ports. They have mostly been in existence for many years, some having been set up over 200 years ago under private or local Acts of Parliament. Normally they consist of representatives of the harbour users (in particular the fishermen) the local authority and, except in Scotland, independent commissioners appointed by the appropriate Minister. Commissions are normally limited in their function to the operation of the harbour and, unlike local authorities, have no income other than their revenues. They usually have the same access to capital finance as local authorities, i.e. grants or loans from the central government, and in the past considerable sums were made available for harbour development. At one time many of the harbours at which this development took place had important fishing industries and their decline has left many substantial works unused and deteriorating. Those still operating suffer from their limited income and tend to be either less well developed and equipped or badly in need of substantial capital expenditure.

Private ownership

There has been little development of fishing harbours under private ownership. The only harbour of any size under private control is at Milford Haven where a private docks company was set up by private Act of Parliament. Even this is a special case since the company is bound to continue to operate the harbour even at a loss. Unlike other private companies it cannot wind up its business. The company has not been a financial success due to the decline in the local fishing industry and the absence of other industries to use the port. Sutton (Plymouth) is the only other private fishing harbour in England and Wales. In Scotland, Lossiemouth is the only private fishing harbour of consequence but the owners do not distribute any profits.

There are a few other private companies operating small harbours mainly as the owners of the adjoining private estates or small local industries.

A few other small havens have facilities owned by Fishermen's Co-operative Associations, the Crown, the National Trust and River Authorities. These are only of minor importance.

ESTABLISHMENT OF HARBOUR AUTHORITIES

The majority of the harbour authorities in the United Kingdom have long histories. Those under local authority control grew up with their authority or were taken over from insolvent commissions, and those under railway ownership or independent commissions were established under special Acts of Parliament dealing with the individual needs of the locality. Since changes in their constitution or powers required special legislation such changes were few and the harbour authorities and their powers tended to become outdated. In 1964 the Harbours Act provided a much easier means of revising harbour authority powers and setting up new authorities. Under the new powers authorities can apply for revision orders under which the Ministers concerned may modify the constitution or powers in any way considered desirable.

FINANCE

Apart from the few largest, those authorities operating fishing harbours find it difficult to raise even limited capital for development works. Even the largest—in common with the largest commercial harbours—are not able to finance entirely from their own resources the costly development now being undertaken or planned. Present policy is (a) to assist the inshore harbours with grants and/or loans for works of improvement etc., if the assistance will promote the maintenance or development of the fishing industry; and (b) to extend to major ports the policy of 20 per cent modernization grants introduced in 1966 for commercial ports making a substantial contribution to facilities for international trade.

In recent years, in England and Wales, only limited sums of Government money have been used for inshore harbours but in Scotland significant expenditure has been incurred, mainly for deepening harbours and the extension of quays to accommodate the larger boats. The level of grant for inshore harbours is generally 50 to 75 per cent, with the balance from a loan or from the harbour authorities' own resources. Ministers can therefore exercise through financial interest considerable planning control.

Harbour authorities' revenue is derived mainly from dues and charges. Under the Harbours Act 1964 harbour authorities are free to decide for themselves the level of dues and charges but users have the right of objection to Ministers against the charges levied.

In Scotland, the Secretary of State may also assist with the dredging of inshore fishing harbours. Two dredgers are operated mainly for use at these harbours and the vessels are hired to the authorities at assisted rates.

APPENDIX

1967 LANDINGS IN THE UNITED KINGDOM

Main Ports

**Type of Authority*	*Harbour*	*Value £ thousands*	*Weight cwts (thousands)*
BTDB	Grimsby (including Immingham)	13,700	3,590
BTDB	Hull	12,800	3,898
H.C.	Aberdeen	7,900	2,118
BTDB	Fleetwood	4,100	928
BTDB	Lowestoft	2,700	457
L.A.	North Shields	1,700	580
H.C.	Fraserburgh	1,400	507
†H.C.	Granton	1,200	258
L.A.	Buckie	800	177
BTDB	Ayr	800	209
Co.	Milford Haven	600	123
		47,700	12,845

Minor Ports

**Type of Authority*	*Harbour*	*Value £ thousands*	*Weight cwts (thousands)*
‡B.R.	Mallaig	590	353
L.A.	Oban	630	348
H.C.	Peterhead	580	170
H.C.	Ullapool	550	525
L.A.	Lochinver	480	127
L.A.	Kinlochbervie	430	121
H.C.	Lerwick	410	218
H.C.	Eyemouth	430	110
Co.	Lossiemouth	370	97
§Co.	Gairloch	330	68
L.A.	Macduff	290	66
H.C.	Newlyn	290	62
L.A.	Scarborough	270	76
H.C.	Bridlington	270	70
H.C.	Whitehaven	270	120
L.A.	Campbelltown	270	60
L.A.	Kilkeel (N. Ireland)	230	89
L.A.	Pittenween	220	53
L.A.	Arbroath	220	55
L.A.	Brixham	210	56
H.C.	Wick	200	49
H.C.	Scalloway	190	96
L.A.	Whitby	190	45
H.C.	Tarbert	180	78
BTDB	Hartlepool	180	37
H.C.	Anstruther	170	35
H.C.	Scrabster	160	40
H.C.	Whitehills	140	31
L.A.	Girvan	140	26
H.C.	North Sunderland	130	43
H.C.	Inverness	120	286
L.A.	Portavogue (Northern Ireland)	120	54
H.C.	Stornoway	120	60
Co.	Plymouth	110	22
L.A.	Amble	110	22
L.A.	Gourdon	110	33
Crown	Ardglass (Northern Ireland)	100	35
		9,810	3,836

***Type of Authority**

BTDB	British Transport Docks Board
H.C.	Harbour Commission or Trustees
L.A.	Local Authority
Co.	Privately owned
BR.	British Railways
Crown	Owned by Crown
†	Forth Ports Authority
‡	To be transferred to Independent Harbour Authority
§	Partly State owned

Fishing Port and Market Planning in Japan

by M. Sekiguchi

Planification des centres de pêche au Japon

La communication décrit l'organisation administrative du développement des ports de pêche japonais. Après avoir examiné les tendances nationales en matière de production et de l'évolution des navires, l'auteur relève l'extrême importance de la pêche dans l'économie alimentaire du pays. On s'attend à un accroissement tant de la demande que de la production de poissons et de produits dérivés. Depuis la fin de la Seconde Guerre mondiale, l'évolution en question a entraîné un essor considérable des ports de pêche, et le processus d'expansion et de modernisation devra se poursuivre.

Celui-ci est favorisé par l'existence d'un dispositif rationnel de planification des ports de pêche et de programmes de développement de ces ports. L'auteur expose la classification des ports de pêche ainsi que les attributions de l'Etat, des autorités locales, des associations de coopératives de pêcheurs, etc., en matière d'élaboration de propositions pour la construction ou l'agrandissement des ports, et passe en revue les diverses installations qu'exigent les ports de pêche.

Il traite ensuite de la structure financière du développement des ports, en s'attachant aux circuits de distribution et aux systèmes de vente, de contrôle de la qualité et de services communs des marchés. Enfin, il expose les tendances actuelles de l'industrie et du matériel, en évoquant leurs incidences sur l'activité future, ainsi que la méthode utilisée pour l'étude et l'évaluation des propositions relatives aux ports de pêche.

La planificación de puertos y mercados pesqueros en el Japón

Tras examinar la tendencia de la producción y de las embarcaciones en el Japón, los autores describen la formulación de planes administrativos para la construcción de puertos en el país. Mencionan la enorme importancia de la pesca en la economía alimentaria del país y creen que aumentará la demanda y producción de pescado y sus productos. Debido a este aumento, los puertos pesqueros se han desarrollado considerablemente desde que acabó la guerra y continuará el proceso de expansión y modernización, proceso que facilitan un sistema bien definido de planificación y programas de construcción de puertos pesqueros.

Se explica la clasificación de los puertos pesqueros y se describen las responsabilidades del Gobierno, de los gobiernos provinciales, de las cooperativas de pescadores, etc., en la formulación de propuestas para la construcción y ampliación de puertos. Se examinan las diversas instalaciones necesarias para los puertos de pesca.

Se examina la estructura financiera del desarrollo portuario y los sistemas de distribución y de venta, de regulación de la calidad y de servicios de mercadeo comunes. Los autores terminan examinando las tendencias actuales en la industria y su material y estudian las repercusiones que tendrán en las actividades futuras. Explican en especial, el proceso de preparación y evaluación de las propuestas relativas a los puertos.

JAPAN is a wholly sea-girt country consisting of a chain of four major islands extending from north to south with several thousand minor islands which constitute a main part of the East Asian Festoon.

A geographical feature of Japan is that the land is mountainous and is short of plains except for the narrow coastal area, and for want of natural resources she has had to depend largely upon the sea. So fisheries have long been a very important industry.

Fortunately, Japan is surrounded by rich fishing grounds where warm and cold currents meet, and her fishing industry occupies a very high place in the world. Today, she has a fishing fleet of about 380,000 vessels large and small, working on coastal, offshore and pelagic fishing grounds. Her fisheries production runs into 7,100,000 tons a year (in 1966, excluding whales) which amounts to approximately one-eighth of the world's total.

In addition to fishing in oceanic and inland waters, shallow sea cultures of fish, shrimp, shellfish, seaweeds, pearl, etc., are carried out.

Production is increasing every year and about 114 per cent increase was achieved from 1960 to 1966.

The fishing fleet is also increasing yearly. The total gross tonnage in 1966, for example was 2,260,000 gross tons which equals 130 per cent of the 1960 total gross tonnage. Powered vessels comprise about 90 per cent of the total gross tonnage and increased to 230,393 in 1966 or by 137 per cent over 1960.

The largest fishing vessel in Japan is a whaling mother ship of 27,000 gross tons. Table 1 indicates the increase of the fishing fleet of Japan in the last few years, and Table 2 shows the number of powered fishing vessels in 1966 by tonnage.

Demand for fisheries products

In Japan, 80 per cent of fisheries products are consumed as foodstuffs and 20 per cent as non-foodstuffs. The Japanese depend for 60 per cent of their animal protein food needs upon sea products. The kinds of fish served as food in Japan are extremely numerous, their variety exceeds 200. And the fisheries also produce non-foodstuff products for fish culture or feeds for livestock. It is believed both demands for fisheries products will rise more and more in future; to satisfy this increasing demand, increased domestic production is deemed indispensable.

Workers engaged in fisheries

Workers in fisheries numbered about 610,000 in 1966, and 71.3 per cent were engaged in the coastal fishery. In recent years, the flow of labour from primary to secondary or tertiary industry has been heavy because of the high development of the Japanese economy. As a result there is a nation-wide labour shortage; and the number of workers in fisheries is decreasing.

TABLE I. TRENDS OF THE FISHING FLEET DEVELOPMENT

YEAR	FISHING VESSELS ON TIDAL WATERS						FISHING VESSELS ON NON - TIDAL WATERS		TOTAL					
	POWERED - VESSELS			Number of non-powered vessels	TOTAL				POWERED VESSELS		NON-POWERED VESSELS		TOTAL	
	Number	Tonnage	Power		Number	Tonnage	Number	Tonnage	Number	Tonnage	Number	Tonnage	Number	Tonnage
		tons (1,000)	HP (1,000)			tons (1,000)		tons (1,000)		tons (1,000)		tons (1,000)		tons (1,000)
1955	142,265	1,067	2,834	243,457	385,722	1,315	29,866	17	144,421	1,070	271,167	261	415,588	1,331
1960	165,602	1,564	3,908	195,114	360,716	1,741	20,012	13	168,470	1,568	212,258	185	380,728	1,753
1965	217,156	2,054	5,683	163,988	381,144	2,176	22,106	14	221,375	2,060	181,875	146	403,250	2,205
1966	226,045	2,128	6,030	153,025	379,070	2,250	20,491	14	230,393	2,134	169,168	129	399,561	2,264

Statistics Table of Fishing Vessels
Fisheries Agency, Ministry of Agriculture and Forestry Japan.

TABLE II. BREAKDOWN OF POWERED FISHING VESSELS ON TIDAL WATER IN 1966

Tonnage	*Number*	*Tonnage*	*Number*
0–4.9T	200,278	200T–499T	867
5T–9T	8,204	500T–999T	106
10T–14T	4,104	1,000T–	168
15T–19T	3,155		
20T–29T	1,445	Total	226,045
30T–49T	3,383		
50T–99T	3,447		
100T–199T	891		

T Statistical table of fishing vessels, Fisheries Agency, Ministry of Agriculture and Forestry, Japan

However, the fish catch per fisherman is increasing remarkably as the result of highly efficient fishing boats as well as the improvement of other fishing techniques.

PRESENT SITUATION OF FISHING PORTS

Fisheries in Japan have been in existence from early times, and fishing port construction, according to some documents, is more than 400 years old. As for the development of ports for modern powered vessels engaging in distant water fisheries, construction was started in 1908 under Government subsidy.

Systematic activity for the construction and improvement of fishing ports under Government subsidy started in 1918 and since then has continued incessantly. Thus, many fishing ports have been constructed and simultaneously technical experience, knowledge and know-how have been accumulated throughout this period of more than half a century.

Japan has a coastline, about 26,000 km (16,000 mi) in total, in comparison with her area, on which as many as 3,900 fishing ports are distributed.

As the fishing port is the primary basis of fisheries, to ensure successful fishing activity, it is of vital importance for facilitating the development of the fishing industry to provide efficient fishing ports and to carry out their proper maintenance and management. From this point of view, the Fishing Port Law was enacted in 1950. This is the basic Law for the administration of fishing ports in Japan. A long-term and country-wide plan was laid down for port development starting in 1951. The programme was twice renewed, with changes of fisheries conditions and the Third Fishing Port Development Programme (started in 1963) is now in progress.

Fishing ports are classified under various headings as below:

General usage and legal classification:

(a) Fishing ports which are almost exclusively (for their major portion) used for fishing purposes	2,800 ports
(b) Fishing ports co-existing with commercial ports and industrial ports	1,100 ports

Type of fishery

(a) Fishing ports principally used for pelagic fishery	20 ports
(b) Fishing ports principally used for off-shore fishery	150 ports
(c) Fishing ports principally used for fresh water fishery	40 ports

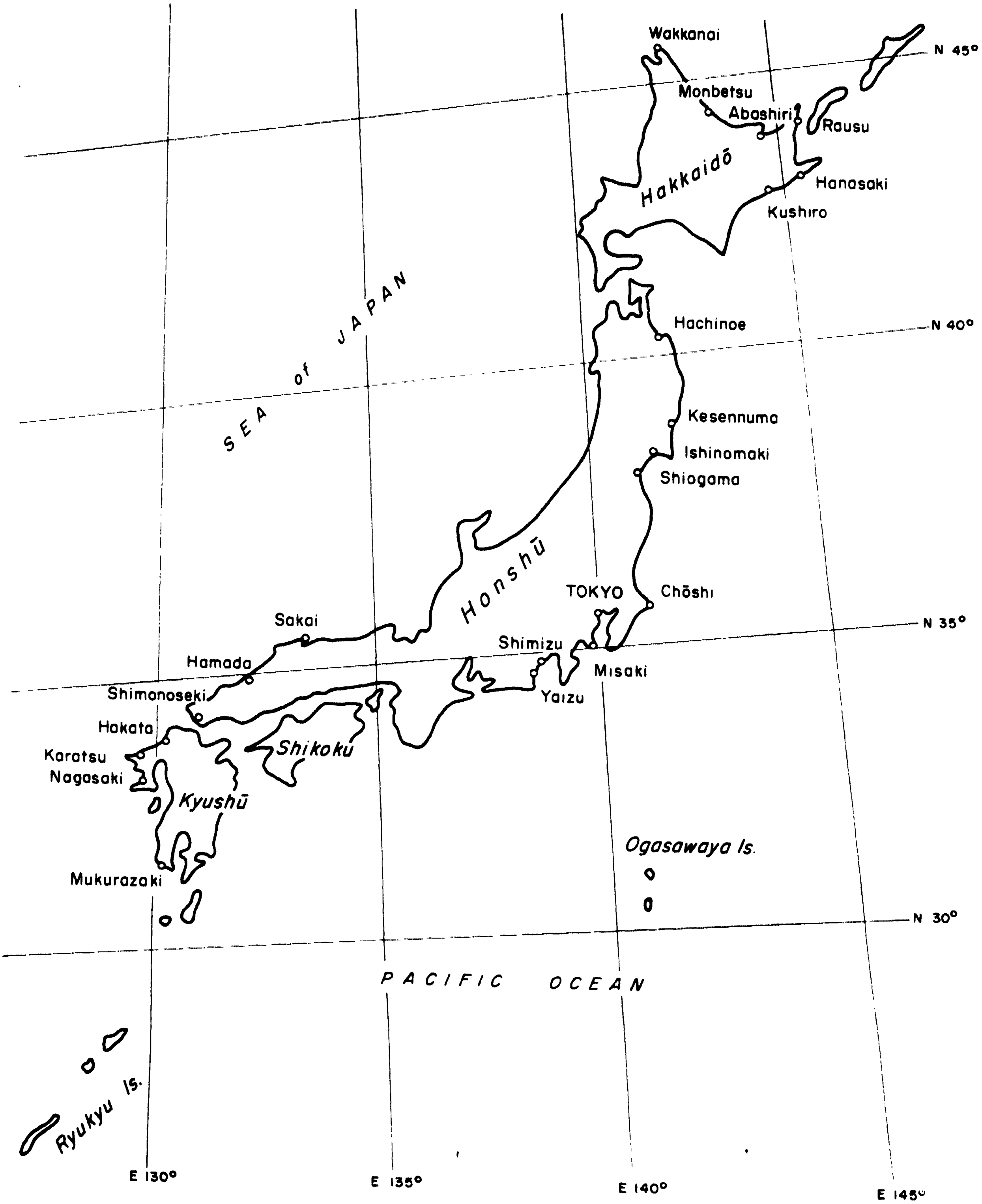


Fig. 1. Principal fishing ports of Japan.

TABLE III. QUANTITY OF LANDING AT PRINCIPAL FISHING PORT IN 1966

(Unit· ton)

No.	NAME OF PORT	LANDING	No.	NAME OF PORT	LANDING	No.	NAME OF PORT	LANDING
1	Tokyō	270,984	9	Chōshi	139,286	17	Hanasaki	67,209
2	Hachinoe	255,169	10	Karatsu	136,264	18	Hamada	65,984
3	Nagasaki	246,264	11	Kesennuma	101,812	19	Sakai	53,475
4	Hakata	238,600	12	Shimizu	90,802	20	Rausu	51,736
5	Shimonoseki	235,135	13	Ishinomaki	82,123	21	Makurazaki	51,479
6	Kushiro	222,731	14	Shiogama	81,996	22	Abashiri	51,140
7	Yaizu	193,181	15	Misaki	74,961			
8	Wakkanai	168,143	16	Monbetsu	73,100			

Annual Report of Marketing Statistics of Fishery Products (including Processing, Distribution), Ministry of Agriculture and Forestry, Japan

(d) Fishing ports principally used for coastal fishery, culture fishing and shelter, etc. Remainder

The geographical location of the principal fishing ports in Japan are indicated in fig 1, and their landings in 1966 are shown in Table 3. Fishing ports of more than 1,000 tons of fish landings a year amount to nearly 740.

GOVERNMENT AND LOCAL RESPONSIBILITY

The system for developing, maintaining, and managing fishing port facilities in Japan is characterized by the Fishing Port Law. The development of the fishing port facilities which are considered as having highly public utility (such as breakwater, channel, basin, quay wall etc.), are executed by the public investment of central or local governments.

The kind of roles which central government, local government and private enterprise generally play in developing, maintaining and managing the ports and markets are as follows:

Central government

(a) establishes the basic plan (on a long-term and nation-wide scale) for the development of fishing ports

(b) subsidizes the local government in the execution of fishing port construction

(c) assists fishermen's co-operative associations and private fishery firms through loans in developing facilities such as auction hall and cold storage.

Local government

(a) assumes the responsibility of management and maintenance of the fishing port

(b) subsidizes the fishermen's co-operative association in the construction of land facilities.

Co-operative associations and private firms

(a) the fishermen's co-operative association develops and manages, with loan or subsidy certain land facilities

(b) the private fishery firms develop and manage, with or without loans from central government, certain land facilities.

FISHING PORT LAW 1950

Designation of fishing ports

The Minister of Agriculture and Forestry shall, upon consulting with the Fishing Port Council, and upon hearing the opinion of the governor of the prefecture concerned, determine the names, types and areas of fishing ports and carry out their designation.

Fishing port council

The Fishing Port Council composed of members chosen for their experience in fishing ports matters, under the supervision of the Minister of Agriculture and Forestry, examines and discusses problems relating to fishing ports, and submits to the administrative offices concerned its recommendations.

Fishing port development programme

The Minister of Agriculture and Forestry shall determine the Fishing Port Development Programme and present it to the Cabinet Council for decision.

Management body (manager) of fishing ports

The Minister of Agriculture and Forestry shall, according to the standard determined, and upon consultation with the Fishing Port Council and the governor of the prefecture concerned, designate the local public entity having that fishing port in its area, as its fishing port management body.

The extent of central government subsidy to local government

When the local government executes a project of construction it will receive a central government subsidy for:

(a) Basic facilities
(b) Land facilities
  (i) Transporting facilities
  (ii) Land for fishing port facilities (only for public use)

Fishing ports organization at central and local government levels

The organizational control of fishing ports at central and local government level are outlined in figs 2 and 3 (with a typical case illustrated).

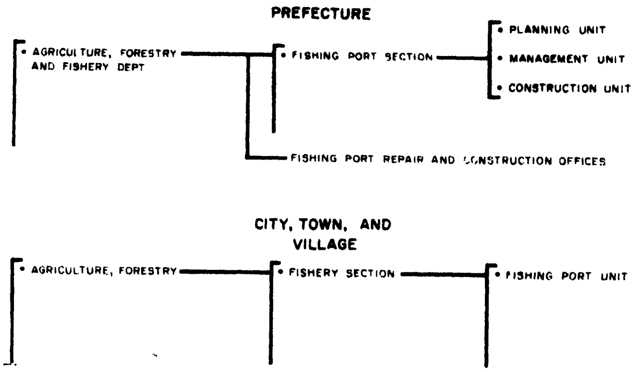


Fig. 3. Organization in local administration.

Finance

The fishery financial structure can be roughly divided into the following two types:

(a) The system by which national public funds are provided for medium scale fishery management and coastal fisheries by the Agriculture, Forestry and Fisheries Finance Co-operation

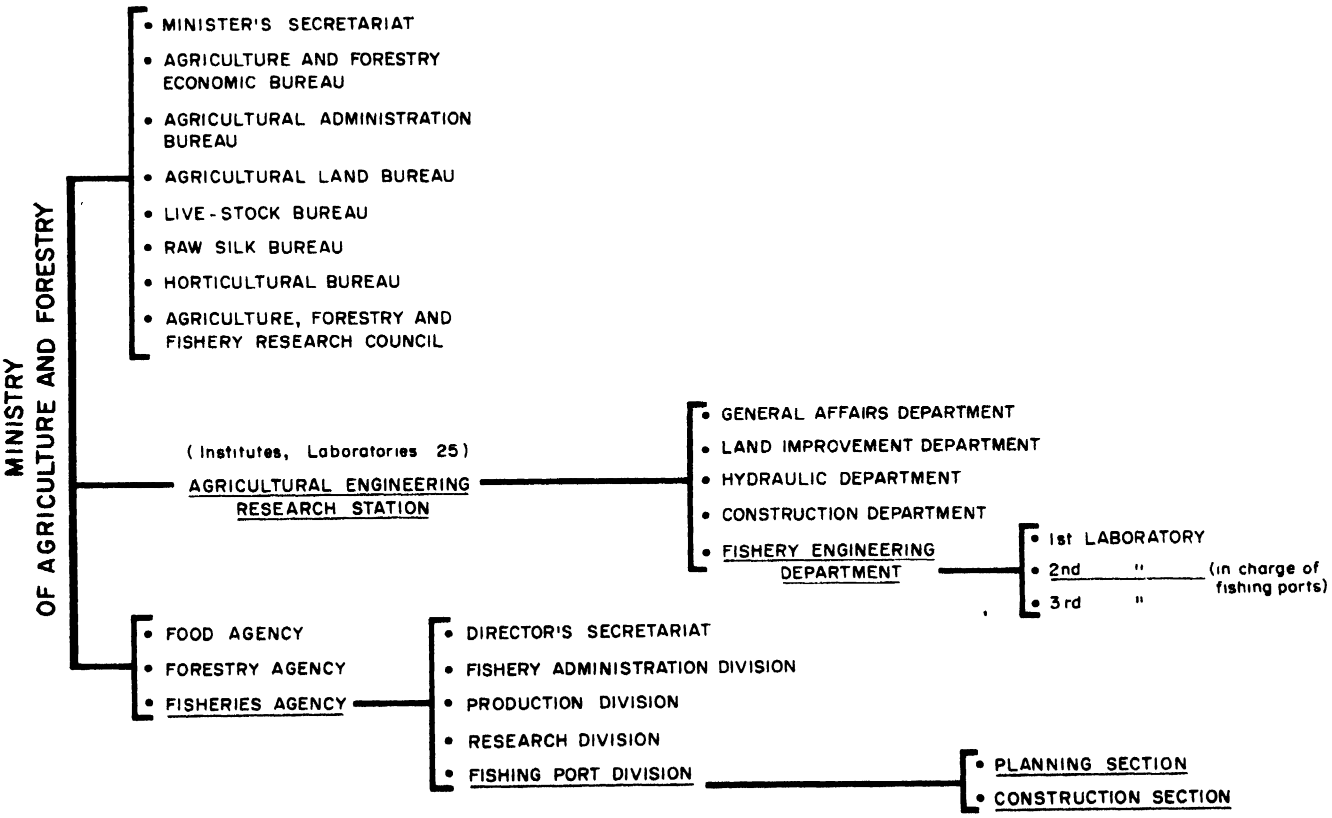

MINISTRY OF AGRICULTURE AND FORESTRY
• MINISTER'S SECRETARIAT
• AGRICULTURE AND FORESTRY ECONOMIC BUREAU
• AGRICULTURAL ADMINISTRATION BUREAU
• AGRICULTURAL LAND BUREAU
• LIVE-STOCK BUREAU
• RAW SILK BUREAU
• HORTICULTURAL BUREAU
• AGRICULTURE, FORESTRY AND FISHERY RESEARCH COUNCIL
(Institutes, Laboratories 25)
AGRICULTURAL ENGINEERING RESEARCH STATION
• GENERAL AFFAIRS DEPARTMENT
• LAND IMPROVEMENT DEPARTMENT
• HYDRAULIC DEPARTMENT
• CONSTRUCTION DEPARTMENT
• FISHERY ENGINEERING DEPARTMENT
• 1st LABORATORY
• 2nd " (in charge of fishing ports)
• 3rd "
• FOOD AGENCY
• FORESTRY AGENCY
• FISHERIES AGENCY
• DIRECTOR'S SECRETARIAT
• FISHERY ADMINISTRATION DIVISION
• PRODUCTION DIVISION
• RESEARCH DIVISION
• FISHING PORT DIVISION
• PLANNING SECTION
• CONSTRUCTION SECTION

Fig. 2. Organization in central government.

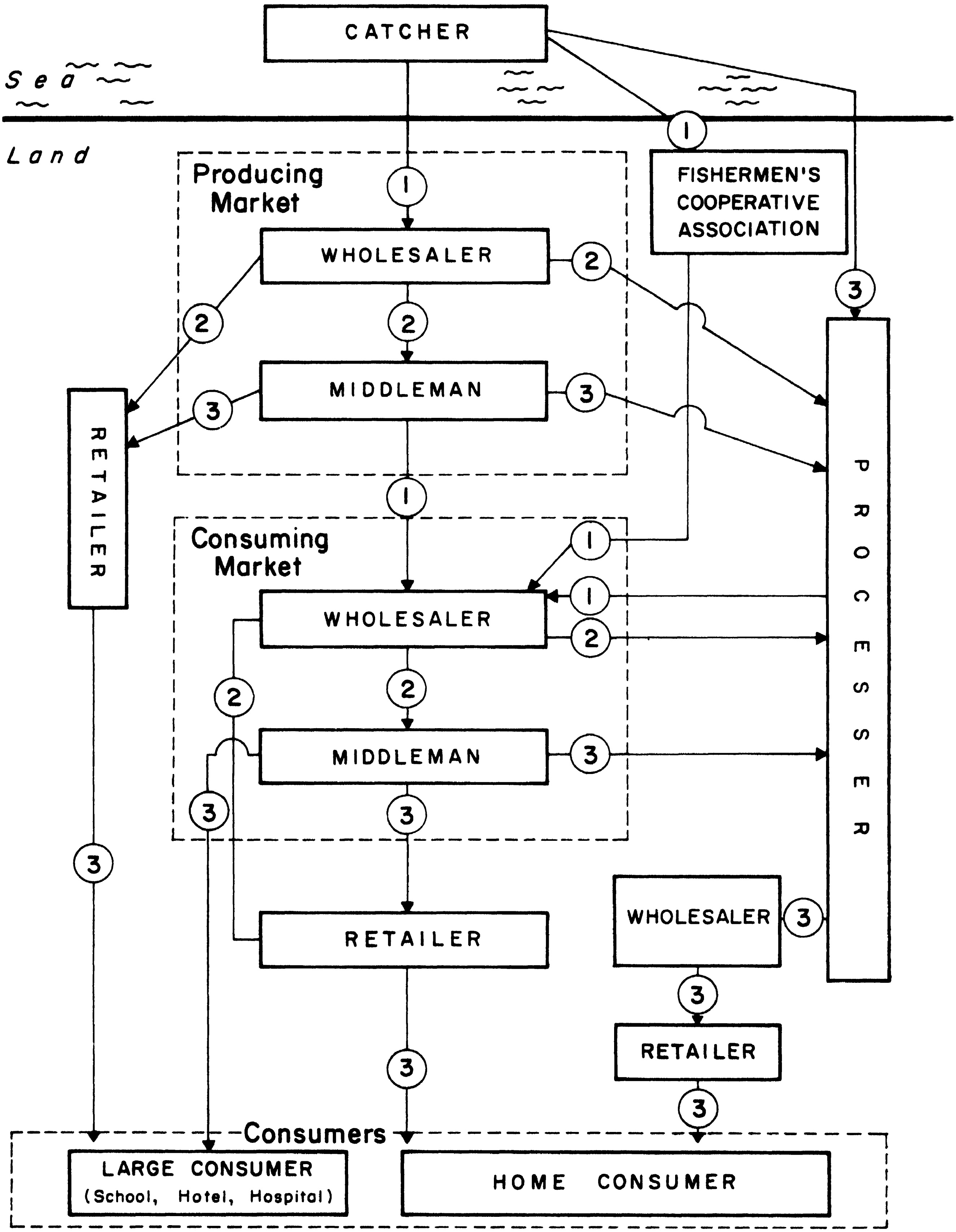


Fig. 4. Distribution channels. Numbers refer to manners of transaction described in Table 4.

(b) The co-operative system, which connects the Federation of Credit Fishermen's Co-operatives and the Central Co-operative Bank of Agriculture and Forestry to the fishermen's co-operatives by area or by type.

Rate structure

The fishing port manager provides management regulations for the ports under his management. The fees for the use of port facilities and the collection of such fees are defined in such regulations. The fees are related to the size, length of berth being used, and the period of time, for each facility in the port.

The principal marketing channels

The typical channels of distribution of marine products are illustrated in fig 4. There are some other specialized channels. The main route indicated is:

(a) The catcher lands the product at the fishing port and consigns the same for sale to a wholesaler at the primary market (a group of catchers often acting as a producing market wholesaler)
(b) The primary market wholesaler sells the products to a market middle-man by auction
(c) The primary market middle-man sorts out the products he has purchased, for shipment to the consuming market, for processing, for fresh consumption and for cold storage. The products to consuming markets are consigned for sale to consuming market wholesalers
(d) The consuming market wholesaler sells to a consuming market middle-man by auction
(e) The consuming market middle-man directly sells to a retailer
(f) The retailer directly sells to consumers.

The presence of the primary market and of a great consumption of marine products in the fresh state may be cited as the special features of the distribution system in Japan. There are three selling systems normally used, namely; auction sale, consignment sale and direct sale (fig 4 and Table 4). The quality of a marine product is generally judged from the freshness, sanitary condition and size aspects. Judgement of quality is made by the middle-man through inspection at the time of auction in the market. Testing the freshness and sanitary condition by scientific means is still in the laboratory stage and is not practically applied.

Suitable means of storage are used throughout the distributing stages as presented in Table 5. To avoid loss in sales due to a deterioration in freshness.

At the fishing port market, various services are offered by the administration of the market, wholesalers, middlemen and other participants in the trade including:

(a) Maintenance of hygienic conditions in the facility
(b) Provision of a financial service for settlement of transaction accounts
(c) Transportation of products within the market
(d) Information service
(e) Supply of ship requirements such as water, ice, oil, food etc.
(f) Storage accommodation
(g) Crew welfare and amenity services.

Market news and information service

For stabilization of the price of marine products and the improvement of the distribution system the Federation of Fishermen's Co-operative Associations, since 1967, provide a service of market news and information.

TABLE IV

Number	*Form of transaction*	*Description*
(1)	Consignment or contract	Transactions are generally made on consignment, but a form of contract called "Sashi" with the minimum price fixed is often observed
(2)	Auction or bidding	"Bid up" is the practice, but "bid down" system is also employed. Usually, the bidding is made in public but, in some instances, is made in the form of tender
(3)	Direct purchase Direct selling	Prices are determined by negotiation between the seller and the purchaser

TABLE V

Procedure	*Purpose*	*Place*	*Remarks*
1. Freezing and cold storage	(i) Storage	Production and consumption sites	Capacity in 1965: Ice making, 30,000 tons/day, freezing, 15,000 tons/day; and cold storage, 5,300 m^2
	(ii) Carriage	Sea	Number of vessels having freezing equipment in 1963: 1,513
		Railroad	4,764 cars in 1965
		Road	744 cars in 1965
2. Salting Drying Smoking	Storage	Mainly at the production site	Plants are generally small in the scale
3. Paste	Storage		The plants range from large to small in the scale
4. Canned	Storage		The plants are generally of large scale
5. Miscellaneous	Storage or carriage	Any place	The products are often ice packed for storage and carriage

FUTURE PLAN FOR DEVELOPMENT

The existing fishing port system presents the following problems:

(a) The demand for marine products is increasing so greatly that more fishing port facilities have to be developed

(b) The size of fishing vessels has increased so much in recent years that a new type of facility is required

(c) Improvement of the distribution system is expected and port facilities should be remodelled to meet this demand.

For these problems a new development programme aiming at the improvement and development of port facilities is being planned by the government.

The programme contents will be put into operation as a five-year programme starting in 1969.

The preparations for the new fishing port development programme currently being made are:

(a) Investigation of the present conditions of fishing port facilities, including an investigation of future usage

(b) Estimation of the demand for marine products based on the trends in the various sectors concerned such as population growth, national production, income elasticity, live-stock production, etc.

(c) Estimation of production of marine products, based on the resources, number of workers engaged in the industry, etc.

(d) Examination of the potentialities of fishing ports in relation to their locations, production, processing and distribution

(e) Determination of the future investment requirements for development of fishing ports

(f) Determination of the geographical distribution of the fishing ports.

The statistics of the various elements essential in the programme preparation are now being examined in order to predict the conditions pertaining in the industry throughout the period of the programme, which is scheduled for completion in 1978.

DISCUSSION

GOVERNMENT AND INDUSTRY ROLES IN HARBOUR DEVELOPMENT

Hovart (Belgium—Chairman) said normal functions of government, whether central or local, were usually the following: training, research and studies, planning and construction, improvements and modernization, repairs and maintenance, coastal protection, infrastructure, financial assistance and support, management legislation, and other port and market facilities. The list of activities was not complete, but generally speaking, it would be the government who must promote and encourage the development of fisheries. These activities might be carried out directly or indirectly through another public body or even through a private association sponsored by the government.

The role of private industry was equally important. Private industry took part in many government activities, for instance, as consultant or contractor regarding repairs, maintenance, and management of the port facilities. On the other hand, industry also provided servicing or functional facilities, for instance, cold storage, ice plants, warehouses, ship-yards, machine shops, freezing plants, and processing plants. Whereas the role of private industry was essentially based on economic interest and business operations, there were many reasons why government should play a part in harbour development. Fisheries development should be incorporated into an overall national economic development programme, and attention given to the development of fishing port facilities. The necessity of training and experience was emphasized otherwise some investments would be unused.

Government might also be faced with an increasing demand for fishery products, so that its basic policy was to increase production or improve productivity. The investment required was normally very extensive and usually not very profitable. For this reason the general national interest was involved, and government had to achieve co-ordination between the ports to obtain optimum development. It was therefore necessary to determine respective responsibilities and to establish a control system. Nevertheless, it was quite clear that government and industry must work together to develop a healthy fishery industry.

Thailand's progress

Karnasut (Thailand) described the role of the Government in developing fishing ports in Thailand. The Government considered fisheries development as a part of the countries overall economic development programme. To facilitate the catch reaching consumers, several landing piers at major fishing villages had been established. These medium and large sized quays, were built and financed entirely by the Government. A Fish Marketing Organization was established in 1953 as a branch of the Ministry of Agriculture. Its duties included the operation of wholesale fish markets in Thailand, the control of the marketing system, and the promotion of fishermen's welfare. Fishing port construction was being planned by the Fish Marketing Organization. At present 26 landing ports existed in Thailand, seven of which belonged to the Fish Marketing Organization, and of this number, two were wholesale fish markets. Thailand was very interested also in developing fishing harbours but high costs were delaying action as the budget was limited.

Lisbon's new fish harbour

Cardoso (Portugal) said that, although it was not a large fishing port, Lisbon harbour dealt with something like 55,000 to 60,000 tons of fresh fish per year, not including landings of frozen fish and crustaceans. Considerable quantities of salted cod were also landed in Lisbon but not normally at the new fishing harbour. It had completely different methods of sale, pricing and processing. The Portuguese had been quite pleased with the new harbour, and, since attending the Conference, he felt even more pleased because it appeared that they had avoided quite a few pitfalls that threatened new fishing harbours. This good result stemmed from the co-operation between Government and industry in developing the harbour.

The intervention of Government had been necessary because the industry alone was not capable of financing the whole scheme. Financing was the first necessary function of Government in relation to fishing harbours. All the details of the financing scheme, which were indeed quite attractive, were described in the Docapesca paper. The Government knew that the facilities to be built, although of convenience to the industry, benefited the public and therefore it provided the funds. The building of the harbour started in 1948 but studies had been carried out in co-operation with the industry for some years previously. The programme foresaw several phases of development to be taken slowly but steadily. Construction was still going on and expansion was always provided for in every move. Although this was slower than the industry desired it avoided costly mistakes.

The constitution of the managing company reflected the equilibrium between the industry and the public interest that was sought and obtained. The main partners were the Lisbon Town Council, the vessel owners and the fishermen, through their respective guilds, and any private or corporate body in the fishing business in or near Lisbon was given a chance to participate in the venture and was of course interested in its success.

In a previous session it had been said that as far as fishing was concerned all countries were developing countries and Portugal certainly was. Fish were of prime importance to it and, in spite of all difficulties and the fact that the Portuguese had been fishing for centuries, it was necessary to develop fishing to the utmost. The construction and operation of this harbour should be a good example for anybody interested.

Educating public demand

Cormack (Canada) said that he had not had time to read the detailed paper about the Docapesca project but it appeared that they had made considerable progress in up-dating the fishing industry in Portugal. He would like to draw attention to the Portuguese participation in the retail trade and the combined attempt to promote the consumption of fish in a practical manner.

Many practical ideas and theories had been advanced in the Conference, but it was not possible to ignore the basic facts, one of which was the acceptance and ultimate consumption of fish by the public. This demanded extensive promotion as fish could only be sold in increased volume if it was presented properly in top quality. Also important was the education of the housewife and catering establishments in cooking procedures, not forgetting education at school level. His experience in demonstrating to groups was that, in the general opinion of the public, fish was not fish unless it had a fishy smell. This was an erroneous opinion and efforts must be made by the industry, with government participation, to eliminate the general idea that fish was a second class food. Docapesca had included in their general scheme a system of promotion and selling from mobile stores which was a radical step in the industry. Perhaps it was too early to make any definite statement but he was sure that participants would be interested to hear if this very vital segment of the industry was meeting with the anticipated success.

Lopez Gutierrez (Mexico) commented on education and training programmes in connection with fish consumption. In Mexico the problem of fish consumption was very great because the people did not have very strong preferences for fish. A government organization handling distribution of fish products in Mexico City recently introduced an education programme, not only by distributing cabinets for frozen fish in various shops but also by opening a restaurant where all kinds of Mexican dishes were served, replacing meat by fish or turtle. The results obtained had been very good. A recipe book was now under preparation which would include all types of recipes based on fish so that housewives might cooperate in promoting fish consumption in Mexico.

Cardoso (Portugal) said that the promotion scheme in Lisbon was developing very well. The consumption of fish by people living by the sea was already quite high, and was increasing even there, due to the better prices offered and the fact that people were taught better ways of preparing and serving fish. However, the greatest improvement in fish consumption was occurring inland where fresh fish was previously seldom available. The diet of people was now improving due to the promotion scheme introduced by Docapesca.

Norman (UK) referred to the diverse pattern of port ownership in the UK and the improved financial position of certain ports resulting from rationalization. One important point was the inability of many ports, including even the largest, to finance their own development plans. To assist modernization, government grants and aid were available to all commercial ports plus additional grants to fishery harbours. Finally, there was a government plan for public ownership of the larger ports which would entail the setting-up of a National Ports Authority and some seven regional authorities. It was hoped this would lead to the improvement of conditions for the local fishing industries at the ports.

Frozen fish in Spain

Pérez Bellod (Spain) described how the Spanish Government and private industry were co-operating in the development of fisheries by introducing frozen foods on a large scale. The marketing network for fresh fish had not been able to absorb the large quantities of frozen fish that were landed in Spain during the last few years since there were very great problems involved in storing this fish. Frozen fish could be sold to the consumer at a price 50 per cent lower than for fresh fish of the same quality, but the large firms and shipowners had found it necessary to open up their own frozen fish markets. They had to organize cold storage trucks, cold storage in the main consumption centres and for chain shops in areas far from the main centres. They even established a pilot centre where they sold only frozen fish prepared in all sorts of ways, whole fish and fillets, sliced and even semi-processed dishes. It was also necessary to publicize this through TV and radio and the television campaign, for instance, not only included slogans "From the sea to the table" but also gave recipes. All these efforts had succeeded in that it was now possible to dispose of the frozen fish fairly smoothly. A better balance between production and consumption had been established with a gain to the consumer sector due to the lower prices of frozen fish.

Hjul (UK) mentioned that a recent FAO booklet—"Fisheries in the Food Economy"—referred to the need in developing countries to build up the infrastructure to handle the catch of improved fishing fleets. It made the important point that adequate ports and distribution systems might be as important as catching capacity. In this connection he said that he was very interested to hear about the mobile fish shops, which were working in Portugal. These travelling shops might be a means of improving fish supplies and also of encouraging fish consumption in some developing countries.

Planning in Poland

Bruski (Poland) describing the part played by the Government in Poland in developing fisheries said that it was his general impression that many people were convinced that everything was decided by the Government in Poland. This, however, was not entirely true. The central planning, and the decisions regarding the direction and extent of the development of fisheries, were in the hands of the Ministry, but the local administrative centres throughout the country had the right to submit their own suggestions. These were then considered by a scientific commission and submitted to the Ministry. In the end the State enterprises had the possibility of choosing among alternatives for their own implementation. He emphasized that it was very difficult to promote fishery development without government aid. The question was what sort of aid the enterprises should expect from the government.

In the first place the Government should prepare plans for development, and give directions as to what policy should be adhered to. Secondly, help was needed for the basic investments, for example, in extending the fishing fleet. Investment assistance for harbours was necessary because it could not be considered desirable first to extend the fleet and then follow up with extending harbours. Such a shortage of landing facilities for the boats would entail losses. Therefore Poland planned and constructed harbours first and then the fleet second. This co-ordination of planning was the main advantage of a planned economy. Cold chains should be based on previous planning and co-ordination of efforts between all parties concerned. This could be quite easily done in Poland as all co-ordination work was done by the Government, receiving suggestions and proposals from the fishing industry itself. Thus the Government obtained the necessary information as to the different lines of thought and tendencies prevailing within the industry. In conclusion he said the Polish enterprises were not forced to accept the directions given by the Government; they just proceeded according to economic aspects. They had to submit an economic reasoning and their balance sheets. This was a sort of control system.

Position in Germany

Meiners (Federal Republic of Germany) gave a brief description of the fishing port situation in Germany, including the different small fishing ports, but mainly the four big ones, Cuxhaven, Kiel, Hamburg and Bremerhaven. On the infrastructure of the ports, he stated that the different Länder governments were responsible, and also for the construction of all the buildings needed for the deep-sea fishery, such as cold stores, factories, and new types of processing plants. All this formed part of the industry, with the Government and its local agencies, as well as the marketing companies, working together on the basis of an exchange of opinions. It was essential that they adapted to present-day requirements and changes in the fishing industry, and that the changes in the industrial structure should be taken into consideration when planning and constructing new ports.

Philippines need for capital

Tapiador (Philippines) said ports were expensive affairs and that capital was scarce in most countries. The financing problem in the Philippines was therefore the major block to harbour development. In fact, without the present pledge of assistance from the Asian Development Bank, his country would hardly be in a position to start establishing her first fishing port. He asked the Conference for information on financing schemes in existence, whether international, regional or national, which could be made available to member countries, thus emphasizing the role of financing institutions in fishing port and market development, in addition to the roles of government and industry.

Bourgois (FAO) said that the member from Spain had explained the great efforts made in his country for developing the frozen fish products market. He would like to know how long it was necessary to keep up these efforts to "obtain profitable commercial returns, and the amount of the investment involved.

Progress in Spain

Pérez Bellod said that he was not able to give definite figures. The first landings of frozen fish in rather small quantities started in 1962, and the rapid development of this fleet, which was subsidized by the Government, was carried out in the following four years and was still going on. The first serious problems of stocking frozen food came up in 1965 and 1966. The setting up of the marketing network had been carried out by different private enterprises, usually large ship owners and producers of fish. Sales prices for frozen fish were much lower than for fresh fish, therefore in a relatively short time sales of frozen fish had increased to a great extent, without reducing fresh fish prices, no doubt since new market sectors had absorbed such large quantities, up to 100,000 tons in 1967. The financing of these networks was in some instances done by credit loans granted by the Government or had been carried out by the enterprises themselves. He regretted that the amount of these investments could not be quoted but as Director of the Port of Vigo his impression was that such investments were quite profitable.

Co-operation in Japan

Yoshikuni (Japan) stated that Fishermen's co-operatives played an important role in the development of fishing ports in Japan, as practically all fishermen belonged to them. Besides production control and administration of the fish market, the co-operative usually initiated the port development plan, which it submitted to the local and central government for approval of subsidies. The government carefully considered and evaluated the plans and made the necessary alterations. An interesting point was that the co-operative also bore a part of the cost. An advantage was that the desires of fishermen were well reflected. This might become disadvantageous, however, if the government failed to integrate the demands of co-operatives into a well co-ordinated plan for an entire region. The Government was now encouraging a merger of co-operatives to meet the new situation of larger vessels with larger fishing grounds, and the need for more concentrated landings at major centres with advanced marketing and processing setups.

Hildebrandt (Netherlands) said that he had the impression that if an industry outside fisheries settled in a fishing region or village, the typical fishery climate would be destroyed and the fishermen would leave the fisheries and enter the new industry. He asked whether government had a task to protect the fishing climate and avoid settling new industries in fishery regions and villages.

To protect coastal fisheries

Winninger (Federal Republic of Germany) in reply, stated that some action ought to be taken to exclude other industrial activities from typical fishing regions. In a fishery, however, the situation was that the enterprises in question also produced other nutritional products, besides fish. With regard to deep-frozen fish for instance, there was usually a general food producing concern involved in the production. In Germany other industries were settling in some fishery ports and it often happened that the fishermen turned to industry instead because of the higher wages. Therefore the fishery climate was in danger of disappearing which was a serious problem.

He then discussed to what extent certain groups of investors in the fishing industry should be aided by government, and was of the opinion that it was necessary to look at the type of fishery practised. In the small sized fishery embracing coastal and cutter operations, he said there was no tendency for bigger capital enterprises to enter this activity as the operations were usually confined to family concerns. But the question looked completely different if deep-sea fishing was considered, because there the development was towards bigger ships and bigger units and for these investments considerable financial support was needed. These investments were beyond the reach of smaller fishermen, so if a large-scale development of deep-sea fishing was desired, people were needed who would be willing to invest substantial sums. In Germany this type of development was encouraged today.

What Vietnam did

Thanh (Vietnam) stated that in the Vietnamese general fisheries development programme the Government had specially focussed on developing fishing ports. Over a period of 10 years they had thus been able to build 16 average sized and small fishing ports. He outlined the general classification of fishing ports in Vietnam. These ports were located along the coast line, usually made of reinforced concrete, and were adequate for landing fish. However, there existed also, fishing ports along rivers because of the vast river network where fishing was of great importance. Along the coastline natural shelters existed and small fishing communities and villages were encouraged to build what might be called "mini-ports" consisting of a jetty and a shed so that from 10 to 20 tons of fresh fish could be landed for local consumption. In average small sized ports there existed freezing storage houses where any surplus production could be stored. In Saigon a large port was under construction. As to the sort of giant ports seen in Cuxhaven and Bremerhaven, it was at present impossible to build these in Vietnam. The administration of ports was by local authorities and co-operatives.

Hildebrandt (Netherlands) said that in his opinion an auction could only function if there were enough buyers. He was anxious to hear views on this question—for instance, must the government try to concentrate smaller auctions?

Lindskog (Sweden) said that it was necessary to have a certain number of buyers. In Gothenburg for instance, 15 months ago, there were 52 wholesalers buying at the auction, but now there were only 25 left. If there were too few buyers, there was a danger of a price cartel which was of no use to anybody. In such a situation it would be better to have a fixed price system.

To share responsibility

Tielenius Kruythoff (Netherlands) said on the roles of government and industry, it was his conviction that government should limit itself to help in the structural sphere, and not give any help in the sphere of operations, as it should be the ultimate goal of government to enable existing or newly established enterprises to stand on their own feet without need of permanent support. Only when this aim was reached could it be said that there had been established a sound economic activity in the area concerned, while in the opposite case—if permanent support was necessary—economic reality would be falsified.

Kube (Federal Republic of Germany) said intervention by government to improve social conditions of the coastal population was a good thing and should be recommended if necessary. This aid would, for instance, involve transfer of workers from fish processing plants and fishermen to other more profitable occupation.

Lyon (USA) and **Scheiner** (IBRD) said that the discussion had shown that government and industry roles in harbour development varied from country to country according to the prevailing geographical, historical, economical and political conditions. There were, however, certain functions which were fairly similar from one country to another. Regarding government roles, these functions might be defined as infrastructure, planning, improvement and modernization, repairs, management and administration, legislation, coastal protection and so forth. Industry, on the other hand, played a dominating role with respect to servicing, processing and marketing facilities. Very often government and industrial activities were quite strongly inter-related.

SESSION XII

Computer-aided Simulation Technique for Harbour Planning

by N. Höglund

La technique de simulation automatique dans l'organisation des ports

La présente communication résume brièvement une étude par simulation, effectuée à la Swedish Shipbuilders' Computing Centre Ltd., pour déterminer la rentabilité maximale des investissements dans les ports. Les travaux ont porté sur le degré d'utilisation des quais, les files d'attente et le temps de service par navire, les dépenses d'investissement et de fonctionnement, ainsi que les heures d'arrivée et de départ et les listes d'attente pour chaque bateau.

L'auteur mentionne en outre brièvement, en exposant les notions fondamentales sur lesquelles il repose, un deuxième projet intitulé "Programme de simulation en matière de navigation", actuellement mis au point conjointement par les universités et l'industrie maritime en Suède.

Tecnica de la simulación de las condiciones naturales con ayuda de calculadoras electronicas para el diseño de puertos

Se hace una breve descripción de un estudio de simulación de las condiciones naturales realizado en el Centro de Cálculo de los Armadores Suecos Ltd., con objeto de determinar las formas más económicas de inversión en los puertos. Los resultados del estudio fueron el grado de utilización del muelle, tiempo de espera y tiempo de servicio por barco, costos de inversiones y operaciones, así como tiempo de llegada y salida y listas de espera para cada embarcación.

Se expone y examina también brevemente en sus ideas básicas un segundo proyecto titulado "programa de simulación de las condiciones naturales de los barcos", que en la actualidad están llevando a cabo conjuntamente las universidades y la industria naviera de Suecia.

SIMULATION means that a mathematical model is made of a certain reality. With the model, which consists of mathematical, statistical and logical connections, studies are then made regarding the results of certain premises given beforehand. The number of calculations needed for the simulation to give a satisfactory result as to the accuracy, is usually very large, and thus it is convenient to use a computer.

Suitable objects for simulation are those phenomena that vary with time and where there are other complicated connections. Thus the events in harbours seem to be suitable to be studied with simulation techniques. Two small simulation studies in which the author has taken part are briefly outlined below. The first a study for the Norwegian Ship Owners' Association made in 1962 regarding the economic effect of different alternatives for enlargement of certain harbours. The second a general study on shipping simulation.

ENLARGEMENT OF HARBOURS

The first study had as its purpose the preparation of a mathematical model to work out a computer programme for the determination of the most economic investment in a harbour and the apportionment of this investment among quay lengths and the purchasing of cranes. Consideration had also to be given to the costs for the enlargement of the facility as to the possible savings which would result from shorter waiting and serving times for ships that visit the harbour.

In a study of this type it is of great importance that the deviation regarding time intervals between the arrivals of the ships, the size of the ship, the size of the cargo and its location in different holds etc., are considered. It is thus not enough to calculate only with average values, since a realistic picture of the queue situation that may arise with the arrivals of the vessels at the harbour is not obtained. The person who makes the mathematical model must investigate how these different items deviate statistically. One knows for instance that events which are independent of each other have a certain statistic distribution and can be described with a certain mathematical expression. Thus it is necessary to determine a certain parameter of these known mathematical expressions for each of the above mentioned items. In the mathematical model one can without difficulty consider the deviation and easily get the computer to calculate times of arrival, the size of the ship etc., so that these items then will deviate in a way that is in accordance with the reality.

Input data

When this actual programme was used and a simulation was made the following input data had to be given:

(a) Tables of the cargo as a percentage of the tonnage
(b) The length of the ship
(c) The costs for liners and trampers respectively (as function of the tonnage)

Concerning the input data it was thus a question of average values. The mathematical expressions that in the following calculations made the computer calculate with more true values were stored in the programme. Further on it was necessary to give tabular statements of cargo per hold as function of the cargo.

Other input data included amongst others were the number of days per period. One year was thought to be divided up into twelve periods. One did not wish to use calendar months, whilst it was supposed that the variations of the seasons could be specified by determining the length of the actual periods. The number of working

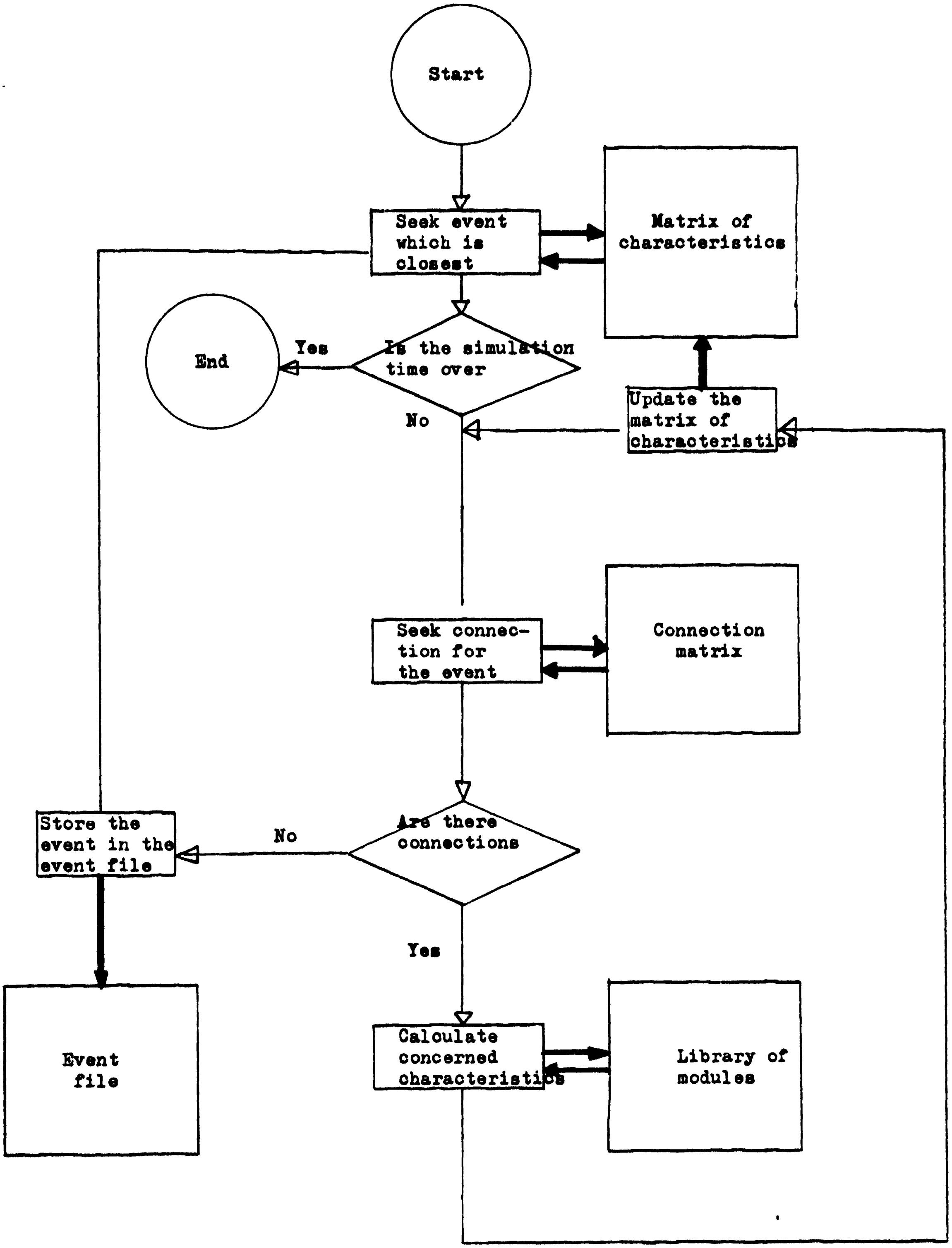

Start
Seek event which is closest
Matrix of characteristics
End
Yes
Is the simulation time over
No
Update the matrix of characteristics
Seek connection for the event
Connection matrix
Store the event in the event file
No
Are there connections
Yes
Event file
Calculate concerned characteristics
Library of modules

Fig. 1. Flow chart for the PSS-system.

hours per day (Monday to Friday, Saturday and Sunday), the average number of ships arrived, the arrived total tonnage and separately the liner tonnage, were given for every period. Furthermore crane capacity, purchase cost of a crane, crane rent, costs for enlargement of the quay, present number of cranes and present quay length were also given as well as different dues such as tonnage dues, cargo dues, etc. Finally it was stated how many periods (total time) one wanted the simulation to last and the number of new cranes and new quay meters in the different enlargement alternatives.

Results

The following final results were obtained. The degree of utilization of the quay, queue time and serving time per ship and period, investment costs, amount of cargo, total cost per period, costs in queue per period, cost per period and tons of goods compared to present enlargement, saving and profitability. The degree of utilization of the quay was calculated as the number of quay meter hours which had been used as a percentage of the total quay length multiplied with the total time that the simulation had lasted. It was also possible to get the departure times for every single ship, amount of cargo carried with them, and cumulative cargo up to this date.

Perhaps even more interesting was that one as a result could also get the arrival time for each ship, how many ships that then were waiting to get to the quay and the time at which the ship actually got to the quay, and how many ships that were then berthed at the quay, and finally the time when the ship was ready to leave the quay.

SHIPPING SIMULATION

The second project is now being developed in our company together with staff from the Stockholm School of Economics and the Royal Institute of Technology in Stockholm. Financial aid has also been given by the Bank of Sweden fund. With experiences from the above project a computer programme for simulation has been developed; this is the PSS-system—Programme system for Shipping Simulation.

The main aim was to make a programme system which was as flexible as possible so that it could be used for many different models without having to prepare new programmes for each model, which would be most expensive and perhaps prohibitive for the model designer. However, when a programme system is made to cope with different models, these must be of one and the same type. It presupposes that the models in this project are such that one wishes to catch a course of events. These events can have different degrees of complexity and can be more or less complexly dependent on earlier events. (Event-operated simulation).

Events

Events can be of different **event types** which are described by their **characteristics.** Events within the same event type have the same characteristics but different values of these characteristics. An event can be represented by a n-dimensional vector. Common for all events is the fact that they have a characteristic, the value of which gives the time of the event.

The figure shows different events where the first one and the last one are of the same event type.

Example: The following can be valid for an event type:

(a) k_0 = arrival time for a ship
(b) k_1 = displacement of the ship
(c) k_2 = engine power of the ship
(d) k_3 = cargo to be unloaded.

Event connections

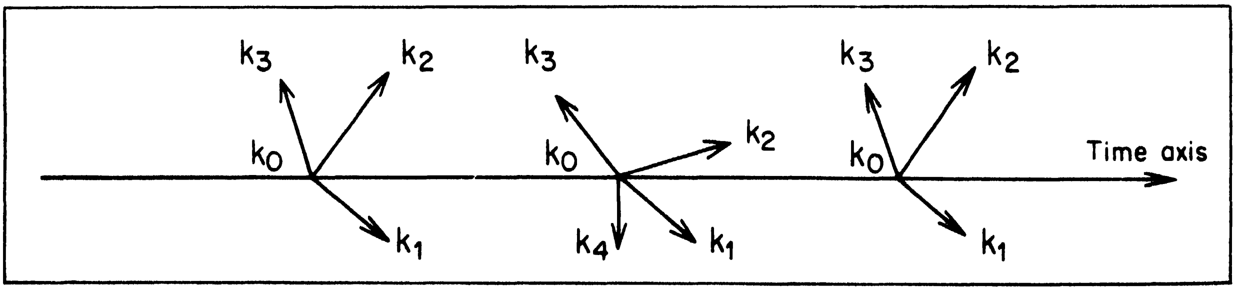
Events of the same and different event types are connected to each other, which can be given exactly with a statement of the dependent position between their characteristics. This dependent position can be seen with a **connection matrix** (fig 1).

The dependent position between characteristics of different events can be deterministic (analytic or logic) and stochastic.

Procedure for describing a model

(a) Different event types are determined and described by means of their characteristics
(b) The dependent position between the event types is clarified by giving the connection between their characteristics in the connection matrix
(c) The points (a) and (b) are examined a number of times until everything is absolutely determined
(d) The kind of connections are determined
(e) An investigation is made whether modules in the PSS-system can be used.

The dependent position between characteristics of different events can, as mentioned above, have different degrees of complexity. As the purpose of the simulations in the project was to study transports (specially sea transports) the same or similar connections would be valid for many



different models. The running costs of a ship as function of different parameters, the unloading time as function of crane equipment, etc. are examples of such connections. By successively producing different models more and more such connections have to be mapped out and programmed. A build-up of a library of programme parts (modules) will be valuable and the purpose with the PSS-system is thus to facilitate the work for the designer so that he shall be able to make a programme for a specific model by using already prepared modules to a great extent.

DISCUSSION

CAPITAL COSTS AND FINANCIAL ADMINISTRATION

Hovart (Belgium—Chairman) said that fishing ports and markets were generally not profitable. One Japanese participant had stated that revenues did not cover costs, hence very serious financial problems occurred and sufficient capital could not be accumulated from ordinary sources. It seemed to him that port and market facilities were constructed by fishermen themselves in the beginning, but as fishing developed, larger port facilities came to be required, and the expense of such structures was too much for the fishermen to bear. It might be argued that ports and markets constituted social capital, the function of which was to serve the common interest of economic development. Such facilities for public benefit normally did not show profit directly, but were always required as the basis of people's welfare and economic development. This could be the reason why basic facilities were normally financed by government, because private industry might not otherwise be interested in infrastructure. Capital costs and basic facilities however, were usually financed by government, while functional or servicing facilities were usually self-supporting by dues and charges. Consideration should be given to the level of the dues taking into account for instance, not only costs, but also financial responsibility and competition from other ports. Here, a number of different arrangements were possible and in some cases financial assistance was received from government. On capital costs, it was quite clear that they largely depended on the size of the port and the market; and capital costs were increasing because of structural changes, such as vessels of larger tonnage and increased horsepower, better accommodation, and so forth. Finally, it should be remembered that financial assistance from government gave it a considerable measure of control, either directly or indirectly.

Lyon (USA) said there had been some very interesting and thorough discussion of countries' various division of responsibilities between government and private sectors in ports and harbours, and he believed an expansion on these in terms of financing would be very helpful.

In the United States, the U.S. Corps of Engineers developed harbours and channels, while the municipal and state governments, and private operators, took over from there. The port facilities were financed through; (1) Private sources—Banks, other lending institutions, open market operations; and (2)—through various government agencies, for instance State Development Agencies, Municipal and Federal Economic Development Administrations, The Office of Economic Opportunity and The Small Business Administration.

Investment sources in Spain

Pérez Bellod (Spain) gave a general view of the sources of investment available to Spanish ports. The Government, through the Ministry of Public Works, carried out a study and general plan of fishery ports, determining a four-year plan where the fishing ports requiring investment were specified. These investments, financed by the Government, were administered by port boards which actually participated in the construction of a large fishing port, and carried out the maintenance of the port with subsidies granted by the Government. These boards received directly from the Government all dues and taxes for the use of the port facilities that the Government introduced on vessels and catches. The total of the taxes collected was used to finance the costs of maintenance of these ports and to extend the port facilities that had already been established in the master plan. These taxes were carefully calculated for each port according to specific rules approved by the Government. These ought to cover maintenance costs and depreciation or amortization of the facilities. It could even be argued that such rates should include reasonable return on the investment, except in cases where such taxes were set very low for political and social reasons. Should these taxes be above the capital requirements of the approved scheme, the balance would go to the Government revenues. Small fishing ports were administered by a centrally located administrative body, and the finance supplied by the Government was administered by a national board on which the fishing industries were represented.

Hildebrandt (Netherlands) said that, in speaking about capital costs of fishing harbours and their profitability, it was necessary to distinguish between the economic value and the social value. In his view a fishing vessel had a private economic value and a profitability, whilst a fishing harbour had a social value which, however, was rather difficult to determine.

French policy on ports

Lafouge (France) said that in France the Government as a rule financed the infrastructure works and that the procurement of equipment for the ports was generally planned by the Government after proposals from the local authorities. With respect to the infrastructure works these were financed through mutual funds from various Chambers of Commerce (local bodies) which were associated with the port administration. These mutual funds represented 50 per cent and sometimes two-thirds of the construction cost of the infrastructure.

As far as the procurement of equipment was concerned (including slipways) this was also financed through the various Chambers of Commerce, who were charged with the procurement, construction and use of this equipment. The sources of financing of these expenses were either the State budget (administered by the Ministry of Supply) or, as far as the Chambers of Commerce were concerned, port dues. These dues were charged according to the value of the fishery products landed, and might vary from one port to another. The dues were laid down by the Government, after analysing the economic conditions in the various ports, and were paid partly by the sellers and partly by the buyers. Financial control lay with the Ministry of Supply.

Thailand's progressive methods ,

Karnasut (Thailand) declared that in Thailand maintenance costs for major fish landing ports, were met by service charges obtained from fish sales at the wholesale fish market. The Fish Market Organization was responsible for the maintenance of the major ports. From the service charge obtained by the Organization, 75 per cent was used in port maintenance and the balance covered the running expenses of the Organization and the fishermen's welfare fund. This latter fund had been used in many small projects such as the repair and construction of small landing piers, the construction of lighthouses and fresh water facilities and so forth. For the second phase of Thailand's economic development plan (1967–71) the Fish Market Organization had asked the Government for a large sum of money to develop fishing ports in the southern area.

Hurst (Canada) stated that, in general, the Canadian Government activity in this field consisted of assuming responsibility for the total cost of breakwaters and dredging, and the provision of dormitory ports on the west coast for which charges were made. No charges were made for mooring on the east coast. The Government might further pay for construcstruction of wharves or share the cost with plant operators. The administration of Community Stages might be either by local co-operatives or local officials.

British producer pays

Cox (UK) said that so far as the main English fishing ports were concerned, both development and operating costs were borne by the producer. The Dock Authority undertook the development but the producer paid for it by dock charges and dues. The British Transport Docks Board who, by law, owned the dock estates, operated on a commercial basis and had to make the ports pay for themselves. These costs could only be recovered through dues obtained from fish sales. As catches were becoming increasingly unprofitable it had become necessary to obtain a subsidy from the Government. This subsidy was small by comparison with some other countries and did not enable producers to make profits. It only kept the industry going. The industry had a very serious problem financially and a new appraisal was being undertaken to try and restore its viability.

Aid given in Canada

Cormack (Canada) said he would like to supplement Hurst's remarks on financial assistance to the industry, as members might have inferred that this was the only assistance available in Canada. The Canadian Government had recognized that there were areas which required special consideration and had designated virtually all of the Atlantic Maritime Provinces, which were dependent to a great extent on fishing, in this category. A special Board had been set up to provide financial assistance to this area, particularly for fresh water supplies. Whilst this was a Regional Board it was administered at Federal level. Federal funds were also available under a separate plan to give financial assistance for the capital cost invested in new or extended shore plants and equipment. As an example, a US $300,000 project which was considered viable would qualify for a grant of 33⅓ per cent of the capital cost. This 33⅓ per cent had to be matched with an equivalent amount by the applicant, which would leave a balance of 33⅓ per cent to be contributed from some other source. In the event that the applicant was unable to raise this balance through normal lending channels he might apply to the Provincial Government for a short-term loan at an interest rate in effect at the time of the loan. In addition, other incentives such as accelerated depreciation on a preset scale might be applied where relevant.

He emphasized that his remarks applied only to shore-based installations, but there was also a Federal and Provincial plan to assist in the purchase of vessels of certain sizes: there were variations due to the various types of vessels. However, the Federal Government did give grants and the Provincial Departments had loan funds for this purpose. There were no schemes to assist in the purchase of fishing gear in Canada.

State active in Eire

O'Mealláin (Ireland) said the full cost of developing the five major fishing ports at present under construction in Ireland was met by the State. The works included dredging to the depth needed, breakwaters, quays, auction halls, port lights and certain services such as roads, water supply lines, sewerage works within the port area, and shipping facilities.

The cost of minor ports was met by the State to the extent of 50 per cent or more, usually 75 per cent, depending on circumstances. The remainder was found by the local authority, usually the county council. There was no private capital investment on fishing port works as such.

Buildings and industrial installations generally were provided by commercial concerns on land, which, if within the port area, were leased from the port authority. The Fishery Authority made no grants for such establishments but the firms concerned might be eligible for grants and loans from appropriate State agencies. The administration of the major fishery harbours was vested in the Minister for Agriculture and Fisheries. Maintenance of these ports was the responsibility of the Office of Public Works, which was a Department of State. The administration and maintenance of the smaller ports was the responsibility of the local authorities. Appropriate port charges were levied in the five major fishery ports. Charges were made at a few of the smaller ports; they were never sufficient to be either a heavy burden on the fishermen or a substantial contribution to the harbour.

Subsidies given in Belgium

Ghys (Belgium) described the system of financing in operation in Belgium. With regard to infrastructure, the State usually paid up to 100 per cent and once the work was finished the town that operated the fishing port received it in ownership. The port facilities were subsidized up to 60 per cent, which proved to be an excellent system so that the credit requests were not exaggerated. Maintenance of infrastructure works and repairs, dredging and sluice equipment was generally provided by the town that ran the port. There was no amortization of the capital invested, the users paid their dues but these did not suffice to cover maintenance costs. The speaker remarked, as the member from Canada had already observed, that it was unfortunate that Government did not apply a uniform system for financing the various fishing ports because the grave economic conditions facing many ports today might lead to excessive intervention.

Advice from World Bank

Scheiner (IBRD) said conditions called increasingly on fishing ports to modernize. He cited the impressive development of container transport in shipping and the adaptation of commercial ports to handling cargo in that way.

Broad view needed

In fishing ports, he pointed out, preparations for tomorrow's tasks should have started already. Many fishing ports are outdated and it seemed as if modernization and new technical approaches had by-passed the fishery industries. In many countries the fishing industries had been treated by government like step-children and were only rarely considered as serious economic enterprises. Generally, governments did not take time to consider means and efforts needed to create proper facilities for catching and marketing. Frequently, one found governments were intervening in their affairs, hampering their proper functioning. Once the general policy of investment had been established and the initial budget for the infrastructure granted, all operations should be left to port authorities which should decide all tariffs and rates to create a viable financial entity. Rates should be related to the cost of the services provided and should produce an adequate return on investments. A non-interference policy would increase efficiency, while lowering costs.

Senior management of ports was sometimes provided by career politicians with no experience in the field, who used their positions purely as a political jumping board. For efficient management, it was essential to appoint a man on his merits who would hold his position on a permanent basis seeing decisions through and bearing the consequences in case of failure.

In many developing countries there was a shortage of qualified management and executive personnel. The few who were available would be seconded to offices other than those connected with the fishing industry. Many governments had not made efforts towards creating facilities for training fishing port operators.

The training of personnel should receive priority. In many developing countries unskilled labour was available, but it was harder to find semi-skilled or junior technicians such as shed foremen, traffic officers, maintenance technicians, equipment inspectors, electricians and so forth. The main reasons were that pay was not high enough and the social status of a non-white-collar man was low. Government and port authority should collaborate to attract young men into port operations. Wages had to be improved, housing supplied, and proper training systems established to enable young men to climb the ladder of command.

Full and complete planning

Regarding planning, the speaker distinguished between the fishery and related industries in developed and developing countries. The problems in developing countries were different from those in developed countries. In developing countries, planning had frequently to cope with a government approach that the fishery industry was of secondary importance and rarely were the required budgets allocated.

Prior to entering upon details of vessels, ports, facilities, etc., a general master plan of a country's fisheries should be established. Fishing ports could not just be placed at equal distances from each other in order to supply local fishing markets. The location of a fishing port should be investigated in conjunction with population, food diets, availability of transportation into the hinterland, availability of fish and so forth. In too many places the situation was that the markets were serving only the immediate area of the fishery port, while at a distance of only 10 km fish was almost unavailable because of transportation difficulties and unsuitability of storage. It was not enough to catch fish and to land them. Their marketing and availability to people further inland was of major importance.

On transportation it was of the utmost importance that proper services be available to get fish to the interior of the country. Road approaches to and from markets and fishing ports should be adequate. Refrigerated trucks, wagons or ice factories should be made available. The marketing and transportation systems of fish to the interior should be adjusted to enable the people living away from the coast to enjoy good food.

Proper planning and co-ordination was necessary to ensure that the fishing markets that were created would serve their intended functions. Only after these problems had been successfully dealt with could one enter into the problems of boat building and construction of harbour facilities.

Master plan required

With particular reference to fishery ports he pointed out that in the past, a fishery port was thought to be a haven for small craft finding shelter and unloading their catches. Nowadays, it was regrettable to see that some authorities were continuing with the same approach whilst fishing craft were getting bigger and more sophisticated.

A master plan for the development of a fishing harbour should be established prior to beginning construction. Proper engineering research should be executed and model tests undertaken and the best possible design produced. Techniques available today both in the field and in the laboratory made it possible to design a port adequate for its task of withstanding waves and currents and such that it would not silt in after a short period.

One often heard officials and even engineers saying "well, it is just a minor port, what can happen there?" This approach was completely fallacious. Was there, for instance, any more reason for carelessness in a fishery port catering for and sheltering two or three hundred vessels and trawlers, which provided incomes for 3,000 people, than it was in a general cargo port with three or four general cargo berths? The engineering and design of a fishery port should be as precise as the engineering of a general cargo port even if its investments were not always similar.

In conclusion he remarked that his comments were just an outline of subjects on which much more could be said and done. Governments of developing countries should have similar approaches to the fishery industry and should treat it at least equal to other major industries of the country.

Appreciation expressed

Lomeli Delgado (Mexico) congratulated the speaker from the World Bank for his valuable statement. He felt that he had been able to get the feel of developing countries, though only a few of them were represented at this Conference. This was not out of lack of interest or needs, but because these were countries where the economic, social and political situation did not make it possible for them to carry out a system of planning. He believed that what had been stated was very valuable and the essence of what the developing countries had come to this Conference for, and which had been made possible, thanks to FAO and the United Nations. Countries like Mexico had very small economic resources, few potential human resources, lack of education facilities; altogether a number of problems had to be solved. The whole problem of developing countries was very complex, especially in view of the population explosion. He emphasized that developing countries had to be helped and guided because although they might have a general idea of what they should do, they were not able to do so unaided. In some countries of northern Europe fishing traditions went back 2,000 years or 1,000 years—developing countries had not that long tradition. The poor countries could not wait 200 or even 100 years, they had to try and solve their problems immediately. Besides technical help and know-how, the experience gained by other countries that had advanced and reached present levels was also badly needed. He stressed the importance of co-operation and exchange of information between the developing countries and the developed world.

Are the investments profitable

Winninger (Germany) felt that the following question should be asked: Were there any studies about infrastructural measures where also the profitability calculations were taken into account? Having noted what the representative of the World Bank had said in connection with developing countries, he remarked that the question of financing the construction of a port was very important, but that also the question of viability must be dealt with. This particular question was the same in developing countries and in developed countries. If, for instance, the situation in German ports were studied more closely quite a lot of over-capacity would be apparent, and the question was, whether the public funds invested there were submitted to any kind of profitability control and what financing criteria had been applied.

Ocampo Siguenza (Mexico) proposed that the Conference draw up a sort of charter of fishery principles which could be called the Bremen Charter. He pointed out that architects had drawn up a similar document called the Athens Charter. These were documents that established general principles and became a general standard for a given branch of activity. He was not sure whether the Conference would be in a position to take measures in this respect, perhaps this might be considered something too general, but it would become a standard, a banner for the future, and the fisheries sector could apply it as a guideline.

Methods used in Poland

Bruski (Poland) reverted to the question of profitability studies of port investments and observed that in Poland such studies had been undertaken and methods of profitability calculation had been worked out for the construction of ports. This was also stressed in Madziar's Paper (Session II), but that not all the methods in use were mentioned there because it was a very complicated subject. Various aspects had to be taken into account; it was not just a matter of infrastructure of each port; there were also the questions of which ports were the best and most suitable for extension, and the optimum capacity of each port. Once those deliberations were done one could start thinking about the infrastructure of the port itself. However, in order to carry out such calculations it was also necessary to know, for instance, what vessels and landings would be coming in. The whole complex framework of fisheries development would have to be considered. That was why, in Poland, they had been trying to solve the problem by using mathematical formulae as well as electronic computers.

How is producer affected?

Hjul (UK) said that a number of statements had been made on methods by which port development was financed in various countries. But he had found little in these statements about the effect of new port developments on the economy of the producers using the ports. To what extent should the user pay, through ship and landing dues, for the improved facility? There were cases where a port authority, by charging too much to the user, could drive fishing vessels away from the port, or otherwise seriously affect those owners landing fish there. The hoped-for benefits of an improvement scheme could thus be lost.

Lomeli Delgado (Mexico) said he thought some difficulties encountered could be corrected by using the most refined development techniques and by organizing groups of experts who had studied different schemes in the world. Thus, Mexican experts had gone to Poland, France and Czechoslovakia through fellowships and so forth, but there were still serious limitations, because the economic means to develop were lacking. The right approach to the problem would not be to copy what had been done in other countries but adapt the different experiences gained in other countries to the actual needs and actual conditions in the country concerned.

Training operators

Cox (UK) said that his Association, in conjunction with the White Fish Authority, had an extensive training scheme for training all fishermen. This scheme covered all personnel from galley boy or deck hand learner up to and including skippers and radio operators. While these fishermen were attending the Nautical School for training they received a basic wage. Quite recently his Association had purchased, at its own cost and without any financial assistance, a training vessel on which young men were taught navigation, the handling of gear and, most important, ship-board discipline for safety at sea.

Cardoso (Portugal) referring to training said that the Portuguese National Laboratory of Civil Engineering had trained several foreign engineers, and it was open to more of them. They were also building a large Fishing School at the Lisbon fishing harbour, and again they would be happy to help any people from foreign countries in need of assistance, within the limits of accommodation.

Price to the consumer

Pérez Bellod (Spain) commented on port costs and their influence on the price structure. Sea foods were so rich in animal protein and so highly necessary in the population's diets that it was important to establish whether prices to the consumer of fish and fish products were higher or lower than for other animal protein. As a rule the consumer was in the last instance the one who paid for the port facilities, implying that the consumer would be charged with the costs accrued in the various sectors of the fishing industry. Actually all dues and levies applied to vessels or the fish were paid ultimately by the buyer.

Gifford (UK) said that as it had been established all over the world that commercial ports could not be economically viable as self-contained units, it was surely self-evident that the less lucrative fishing port must inevitably be an even greater charge upon the state. This meant that investment by such bodies as the World Bank could not be assured by normal cost-effectiveness standards. This must be related to the eventual use of the fish, whether for profitable luxury export or for home consumption by the population of the developing country. Scheiner had pointed out that most of the discussion had dealt with the problems of the developed countries. This, surely, was the result of a series of papers based on the total world experience of modern fishing ports, the great majority of which were in the developed countries. This should not be read as a lack of interest in the problem of poorer countries as the reverse was definitely the case.

Governmental considerations

Stammers (UK) stated with reference to Scheiner's comments, that he would first make it clear that although he was a consulting engineer he shared Scheiner's views. He also agreed with Gifford's comments regarding the terms of reference for the Conference, inhibiting, indirectly, expression of views similar to those of Scheiner.

He had already requested more comprehensive terms of reference for studies and investigations. He also suggested that organizations such as the IBRD were very favourably influencing present trends. He hoped that this would continue and that participating Governments would find themselves able to add to the influence already at work, and to include such matters as training, operational studies, maintenance studies and so forth on their general terms of reference and thus to use the available expertise to the greatest advantage. This would include, of course, the secondment of competent counterpart personnel to work with the experts during the course of the studies.

Cardoso (Portugal) stated that as far as the development, operation and managements of the new Lisbon fishing harbour were concerned, everything was explained in detail in de Carvalo Cunha's paper (Session VI). The development of that new port evolved slowly and carefully and it had been greatly subsidized by the State itself. Regarding the small fishing ports of his country, they were built by the State and the artisan fishermen did not pay harbour dues.

Bourgois (FAO/IBRD) observed that at the beginning of the session the problem of assistance to developing countries was raised and this was a subject of deep concern to FAO. Recently a meeting had been held between officers of UNDP, FAO and IBRD to find means to improve the efficiency of assistance to developing countries.

While assistance in setting up research institutes or making research studies had been generally efficient, problems such as giving incentives to the formation of fisheries enterprises and improving fish marketing were specially difficult to solve. This latter problem often involved bringing about a change in the population's food consumption habits.

SESSION XIII

Economic Aspects of Planning and Management in Polish Fishing Ports

by Z. Bruski

Aspects économiques de l'organisation et de la gestion des ports de pêche Polonais

Avant la Seconde Guerre mondiale, la pêche maritime n'était pratiquée en Pologne qu'à de faibles distances et sur environ 145 km du littoral. Certaines compagnies de pêche fondées au début des années 30 ont armé des chalutiers et des drifters, ce qui a influencé l'agencement et l'infrastructure des ports. Il n'existait alors que de petits ports, le grand port de commerce de Gdynia commençant seulement à se développer. Les bâtiments et ouvrages étaient de petite taille et leur implantation n'avait pas fait l'objet d'une étude rationnelle.

Après la guerre, les pêches polonaises ont connu un vif essor sur les 500 km de littoral. Des ports de pêche ont été reconstruits et agrandis, et le port de pêche hauturière de Swinoujście a été bâti de toutes pièces. En vue de la rentabilité et de la modernisation, on s'efforce de grouper rationnellement toutes les fonctions qui doivent être celles du port de pêche. La mise sur pied d'une flotte de pêche moderne a posé de nouveaux problèmes tant aux ports qu'à l'arrière-pays. On a procédé à des calculs sur la capacité de production des ports et de leurs installations annexes par rapport à l'hinterland. Dans ces calculs économiques, on s'attache à optimiser les rapports complexes flotte/port/arrière-pays.

Les principaux problèmes devant être étudiés comprennent notamment les éléments suivants:

(a) Détermination de la production optimale des ports, c'est-à-dire de l'ensemble des installations nécessaires au service des navires et des chargements
(b) Etablissement des diverses fonctions devant être remplies par les ports de pêche, compte tenu du principe de l'unification et de la concentration des installations
(c) Choix entre spécialisation ou polyvalence du port, et établissement d'une liaison entre celui-ci et les installations de l'arrière-pays
(d) Progrès techniques et organisationnels dans l'activité des ports de pêche.

Après 23 ans d'opérations, la République populaire de Pologne a acquis une expérience considérable en matière de pêches maritimes. L'essor continu des pêches, qui a entraîné un accroissement des prises de plus d'un million de tonnes, a requis l'exécution d'études approfondies en vue de résoudre au mieux les problèmes du développement des ports. Ces problèmes sont confiés aux établissements de recherche, aux bureaux d'études spécialisés, et aux divers départements techniques, technologiques et économiques des grandes écoles.

Aspectos economicos de la planificación y administración de los puertos pesqueros Polacos

En el período anterior a la guerra sólo se llevaba a cabo la pesca a poca distancia, a lo largo de 145 kilómetros (90 millas) de la costa. A principios del decenio de 1930 se establecieron algunas compañías pesqueras que pusieron en explotación barcos para la pesca con redes de arrastre y de derivas. Esta situación influyó en la disposición de los puertos y en sus infraestructuras. Unicamente existían pequeños puertos, y el gran puerto comercial de Gdynia sólo había empezado a desarrollarse. Las edificaciones y estructuras de los puertos eran pequeñas y no estaban bien proyectadas.

Durante la posguerra, se inició el dinámico desarrollo de las pesquerías polacas a lo largo de 500 km (312 millas) de costa. Se han reconstruido los puertos pesqueros y se ha procedido a su ampliación. El puerto pesquero para pesca de altura de Swinoujście ha sido creado en su totalidad. La utilización económica y la modernización de los puertos propone integrar adecuadamente todas las funciones del puerto pesquero. La creación de una moderna flota pesquera ha propuesto a los puertos nuevas tareas así como a todo el interior del país. Se hicieron cálculos de la capacidad de funcionamiento máximo del puerto y de su complejo de instalaciones y estructuras en relación con el interior. En los cálculos económicos se considera el modo de elevar a su valor óptimo la compleja relación existente entre flota, puerto e interior.

Entre los principales problemas que hay que estudiar se encuentran los siguientes:

(a) establecer la capacidad de funcionamiento máximo de los puertos, es decir, del conjunto de instalaciones dedicadas a atender a los barcos y a los cargamentos
(b) determinar la serie de funciones que son necesarias en los puertos pesqueros a base del principio de la integración y concentración de las instalaciones y servicios
(c) elegir entre la especialización del puerto o su dedicación a diversos fines, y la cooperación entre los puertos y los elementos y servicios interiores
(d) adelantos técnicos y organizativos del trabajo en los puertos pesqueros.

Después de 23 años de trabajar en el mar, la República Popular Polaca ha obtenido una considerable experiencia en las pesquerías marinas. Un ulterior desarrollo de las pesquerías, que prevé el incremento de las capturas hasta más de un millón de toneladas, ha exigido serios estudios para encontrar las soluciones óptimas en lo referente a la construcción y mejora de puertos. De los problemas relativos a los puertos se ocupan los institutos de investigación, las oficinas especializadas en el proyecto de ellos, y los respectivos departamentos técnicos, tecnológicos y económicos de las escuelas superiores.

IN the pre-war period sea fisheries were carried out along only 145 km (90 mi) of Polish coastline, by means of boats and small cutters in inshore waters. The landings of that fleet fluctuated around 16,000 tons of fish per year. For those operations there were three small ports: Hel, Władysławowo and Jastarnia, and a few small beach harbours (Rewa, Kuźnica, etc.). Also, the port of Puck and the newly built commercial port of Gdynia were used as mother ports. There was a fishing pier at Gdynia to serve as a base for the deep sea fishing fleet, then starting to develop, which consisted of a few trawlers and drifter-trawlers owned by various fishing companies.

After the war the Polish fishing fleet did not exist and the ports were destroyed. But the lifting of some sunken vessels gave a start. State fishing companies and fishing bureaus were established and they jointly started reconstruction of the ports along the coast of 500 km (312 mi). Dynamic development of the fishing fleet was commenced, both for boat and cutter fishing operations in the Baltic Sea, and trawling in the North Sea. Landings exceeded 100,000 tons per annum. Polish ports were adapted for the new fleet. The year 1960 was a decisive one. Since that year, owners have been equipped with factory trawlers. At the end of the 1967 there were in operation 14 part freezers "B-20", 11 freezing trawlers "B-23", 6 freezing trawlers "B-18", 22 factory trawlers "B-15", 53 conventional trawlers, 42 drifters, 458 cutters and nearly 1,000 small fishing boats.

The plan provides for further development to be based on:

(a) steady increase of a modern fleet of trawlers and factory trawlers
(b) introduction of modern fishing units of omptimized design for old trawlers and cutters retired from the fleet
(c) development of fishing fleets for distant water operations, i.e. mother ships, catchers and auxiliary units
(d) application of progressive fishing methods and fishing gear.

Fishing grounds—catches—landings

The fleet operates in four main regions: in the Baltic Sea (boats, cutters) in the North Sea and adjacent areas, i.e. within the NEAFC convention area (trawlers, drifters, 24 m (80 ft) cutters in co-operation with mother ships) in the North West Atlantic, i.e. in the ICNAF convention area (factory trawlers) and in the fishing grounds off West Africa (distant water trawlers and freezing trawlers). Factory mother ships operate mainly in Atlantic fishing grounds.

The Baltic fishing fleet delivers the catches from short fishing trips, lasting one or at most, a few days. The fish (mainly cod, herring and sprat) is packed into wooden cases in ice. Most of the fish is caught with bottom trawls and partly with bottom pair trawlers, whereas salmonoid fish are caught with driftnets and lines. Some catches also are made with seines, with hook sets and with set gear. Two fishing seasons are distinguished in the Baltic fisheries, one for cod and sprat, lasting from February until April, and another for herring, from June until September. The landings show large seasonal fluctuations and vary from week to week, as well as in particular months.

The North Sea fleet lands mainly salt herring from their 25-day trips, whereas trawlers bring landings averaging 100 barrels of herring and about 10 to 30 tons of fresh fish packed loose in ice, from their last few days of fishing. Their return home takes about three days. The extension up to 100 days of fishing operations for drifter-trawlers and cutters 24 m (80 ft) long takes place in co-operation with mother-ships handling herring, and either taking the fish to ports in cargoes of about 16 to 25,000 barrels, or using additional carrier ships discharging 3 to 5,000 barrels into each. The catches in the North Sea show seasonal fluctuations and intensive fishing takes place from May until October.

Factory trawlers carry out independent fishing in trips of 70 to 90 days taking fuel, water and provisions in foreign ports, or 90 to 120 days. These vessels land fish fillets and headed and gutted frozen fish, mainly cod and redfish, packed into cardboard boxes, and also fish meal in bags and fish oils. When they go to the Georges Bank grounds they also bring in herring frozen in blocks.

Distant water trawlers operate in the North Sea and adjacent waters, catching mainly herring and mackerel. Also, along with freezing trawlers, they operate on African fishing grounds and on Georges Bank. The trips to Africa vary in duration, from about 60 days to over 200 days.

Polish long-range catches with mother ships of a type introduced in 1967, factory ships B-67, still remain experimental. Their duration is 100 days and they bring back about 5,000 tons of frozen fish, fillets, headed and gutted fish, and whole fish in blocks, as well as fish meal and fish oil.

Most of the fleet is owned by state fishing companies of diverse activities, including, besides catching, fish conservation, some of them fish processing, cold storage and freezing, ice factories and a full range of port and fishing services. They are also responsible for the management and administration of fishing ports. A part of the fishing fleet, consisting of fishing boats and cutters, belongs to fishing co-operatives, with annual landings about 26,000 tons, mostly from the Baltic, and to private fishermen, with annual landings from the Baltic Sea of 16,000 tons. This fleet is stationed either in small cutter ports, being under the management of the co-operatives (e.g. Łeba, Dziwnów) or, partly, in small ports, being under state administration. As a rule the vessels are bound to their home ports, to which they deliver fish. Occasionally, in view of short distances or congestion in their home ports, they land fish in some other Polish port.

Fishing ports under planned economy

The planned economy aims to achieve such co-ordination between ports and fishing fleet, and between the ports themselves, as to permit the best servicing of the fleet, and the best utilization of its operational time for fishing at the lowest cost of investments, and of operation of port and fleet. The ports should also provide efficient handling of cargo, and proper social conditions for crews. Hence along with the term "fishing port" we have the term "fishing base", relating not to the port alone, but also to its background and auxiliary facilities, under the management of the fleet owners, the administrators of the ports. This is to be accomplished through methods of planning and organization, intended to eliminate as far as possible the negative effect of irregular fleet arrivals to the ports, and to reduce uncertainty. On the other hand the ports should ensure efficient handling of fish, and its prompt delivery to processing plants and marketing centres. In the ports for the oceanic fishing fleet, the main task is prompt and efficient servicing of the vessel, which includes the care of the crew and speedy dispatch of the cargo, whereas fish processing in the port is treated as a secondary matter and is associated with the fishing base, and even port hinterland. As a result of using modernized fishing fleets, preserved and frozen fish is landed and processing is not now done in the port.

In the ports servicing conventional fishing fleets, particularly the short-range cutters landing fresh fish, the handling of raw material is closely combined with servicing the vessels

In small fishing harbours the problem involves the synchronization of the taking over of the fish by trade companies with the time of arrival of the boats which includes simultaneously the supplies of necessary commodities, mainly packings and ice.

In all ports and harbours an important factor is the provision of full rest, medical and recreation facilities for the crews.

In the planned economy the prime task is optimum development of the network of fishing ports and fishing bases with port and background facilities through reasonable localization of the fishing and auxiliary fleet, and rational utilization of resources at the lowest cost.

Functions of ports and fishing harbours

The range of functions of the port depends first of all on the character of the port itself. Adequate criteria for the uniform classification of fishing ports are not yet established. Neither is there a conformity of views in the professional literature on defining the meaning of a fishing port. Besides secondary functions, such as services and facilities for the fishing fleet, of primary importance in a free-market economic system is the organization of fish auctions, and fishing vessels would prefer to discharge at the port at which they expect to get the highest price for their fish. In the system of planned economy, the port is one of the important links in the whole cycle of servicing ship and cargo irrespective of the prices obtained for caught fish. There are fixed steady prices irrespective of the place and season of discharge. The fishing fleet will, as a rule, return to its home port, going to some other port only in case of congestion in its own port, whilst in the other port there is available unengaged service within the system of co-operation between ports, or in the case of force majeure such as gales and ice. The definition might be confined to the problem of minimum functions, to which the terms "fishing port" or "fishing harbour" should correspond. In this sense it is "the complex of facilities ensuring safe berthing of fishing vessels and guaranteeing necessary service".*

As the criterion for Polish fisheries, there is in general accepted the division of the ports according to the type of fleet stationed there, viz:

(a) harbours for small fishing boats
(b) fishing ports for cutters and small fishing boats
(c) ports for the deep sea fisheries fleet, recently defined as the "oceanic fishing fleet".

Fishing boat harbours are numerous. They are located all along the coastline and are utilized by fishermen from small fishing villages. They are of minor economic importance. Boat fisheries are carried out mostly by local populations, and while most of their catch is sold by them locally, particularly in summertime when they sell fish to tourists, a part of their catch is purchased by co-operative or state marketing companies, which at appropriate times, send their lorries to collect the catch. These harbours are usually equipped with only a windlass for boats, the so-called "beach harbours", or with reinforced piers or discharging platforms (e.g. in bays). They may have weighing stations for the sale of fish, and possibly trenches or mounds for ice and stores. The harbours also have hoists for net drying or repairs. Similar equipment is found in those places at which fishing with beach seines is still carried out, though there are few of them left in Poland.

Cutter ports

Ports for the cutter fishing fleet are divided into state administration and co-operative management, i.e. the work co-operatives for sea fisheries, incorporated in the National Union of Work Co-operatives.

Among the ports under **state administration** there are:

(a) Hel—an artificial port built in 1892/93 on the bank of the North West coast of Hel Peninsula. The depth of the docks is 3 to 7 m (10 to 23 ft). This port does not freeze over, even in severe winters. It is also used by foreign cutters for shelter
(b) Władysławowo—the port was built in 1929 to 1937 at the base of Hel Peninsula, with a depth of 4 to 6 m (13 to 20 ft). It was modernized 1965 to 1968 with new concrete quays, and development and extension of its facilities. The company "Szkuner" has a large cutter repair yard here. This port is also used by foreign cutters for shelter
(c) Ustka—a small commercial and fishing port, modernized 1965 to 1968. This port has also a small ship-yard, launching inter alia plastic boats
(d) Darłowo—it is a small commercial and fishing port, situated at the mouth of the River Wieprza. It has a small dock for cutters and repair shops
(e) Kołobrzeg—an active commercial port at the mouth of the River Parseta with vast modernized background facilities. This port is utilized by the Fishery and Fishing Services Company "Barka"
(f) Puck—fishing and yachting port without background facilities, under the administration of Gdańsk Maritime Board.

The following are ports under **fishing co-operatives:**

(a) Dziwnów—(Szczecin district)—a small port for cutters and fishing boats
(b) Łeba—(Gdańsk district)—at the mouth of the river of the same name. Here operates the Co-operative of Sea Fisheries "10 Lecie PRL"
(c) Jastarnia—at the Puck Bay. Jastarnia was modernized in 1966. It is a small port for cutters and fishing boats
(d) Gdańsk—(Górki Wschodnie)—two small fishing ports, situated in the same region at the mouth of Vistula. There is a small co-operative ship building and repair yard, located in another region of the port of Gdańsk. The fishing port in Gdańsk was built on the quay Polski Hak—in the years 1964 to 1967.

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* The classification of fishing ports has been discussed by R. Morgan in his book, *World Sea Fisheries*.

Deep sea ports

Ports for the deep sea (oceanic) fleet are:

(a) Gdynia—a fishing port built in 1926 to 1934, utilized by the Deep Sea Fisheries and Fishing Services Company "Dalmor". It is situated in Gdańsk Bay and includes a pier with quays, with a depth of 8 to 9 m (26 to 30 ft) in the I and II Docks of the commercial port. The port is still being developed and modernized

(b) Szczecin—the fishing port was built here in the 1950s, based on utilization of the quays: Bułgarskie, Cal and Oko, with a depth of 7 m (23 ft). The fishing port is situated on the Bułgarskie quay, presently being enlarged, and on the Oko quay there is located a cannery and cold storage house, still under construction. These areas of the port are utilized by the Deep Sea Fisheries and Fishing Services Company "Gryf". Considerable enlargement of the port is planned. At the quay there are also stationed mother ships with the auxiliary fleet, owned by the state company Dalekomorskie Bazy Rybackie (Deep sea Mother Ships)

(c) Świnoujście—a newly built fishing port at the mouth of the Swina, it was started 1952 to 1955 and gradually enlarged in successive years. At the present time the annual landings are about 36,000 tons, mostly frozen fish. This port was designed and built as a fishing port for trawlers and drifters, which had to land fresh fish, hence the large cold storage house with freezing installations. In spite of this, the demands from the Polish market forced for some years upon this port the discharge and handling of salt fish. When first freezing trawlers were brought into exploitation, the handling of such fish landings as corresponded to initial planning was commenced, but the port is being considerably enlarged.

SPECIALIZED PORT FUNCTIONS

Various functions are assigned to particular fishing ports, which depend upon the character and the tasks the ports have to accomplish.

In fishing harbours, the first essential is prompt discharge of fish and its transport to destination, whether processing factory, marketing companies, cold stores or fish meal factories. In supply, the most essential is ice and boxes.

In ports for cutters and the deep sea fishery fleet, normally the whole range of functions is maintained, both fundamental ones—connected with servicing ships and fish—and additional ones. The question of what range of functions necessary in the port or fishing base, i.e. what degree of self-sufficiency, and which functions are to be localized in the port and which outside the port, is open to discussion. In fact the ports include the following range of functions:

Operational service—Every cutter port under state administration has a short-wave radio service to maintain continuous communication with the fleet (every cutter has receiving and transmitting radio equipment). The cutters are kept informed on actual meteorological and fishing conditions and they get orders from their fishing enterprise, while in turn the cutters transmit the data on catches which are used for the current fishing service. Skippers advise, by radio, the dates of entries into the ports, report the cargo, and order supplies or repairs. It is thus possible for the port administration to establish the flow of ships' entries and get advance information on how many ships will enter the port, what cargo they will bring and what are their needs and requirements.

Stevedore's service for all operations connected with discharge and loading.

Repairs—Servicing in the first place the so-called inter-trip repairs and current overhaul.

Net-gear service—Its task is to supply cutters with necessary fishing gear and rigging and repairs of gear.

Equipment service—This includes the supply of a variety of packings and boxes for the vessels and their repair, the supply of fuel, provisions, water, salt, household articles, technical articles, etc., and ends with the problem of a storehouse for deposited goods.

A separate service is the supply of ice. This is done either by cold stores, existing in most of the Polish fishing ports, by ice factories, as in the small port of Górki Wschodnie, or, in small ports, the ice is stored under ground or transported from neighbouring ports.

Crew service—The term "ship service" also includes services for the crew. This is done by two organizational sections of the fishing company: the crew department and the social amenities department, and by the local organization of the Sailors and Stevedores Trade Union. The crew department deals with all the matters of personnel: manning, holidays, fishing crew reserve, daily workers, etc. The department of social amenities organizes, in cooperation with the local organization of the Trade Union, the facilities for fishermen's holidays and leisure time. It maintains fishermen's homes and clubs in every port, takes care of the families of fishermen, organizes holidays for fishermen in rest centres, Sunday recreations, sport and cultural entertainments, maintains the exchange of books in ships' libraries, films, games, musical instruments, etc.

Fish handling

The transfer of cargo—This is performed by the fish purchase section and the staff of the owner's classification (grading) service. This consists of freezing and classifying the fish in respect of assortment and the stage of processing, the quality, and price fixing according to the fixed price-list in force.

Handling of fish—This includes: gutting, heading, filleting, salting, portioning and all kinds of sorting fish, connected with such other handling as washing, freezing, icing, packing, and determination of species and their quality. In deep sea fisheries ports this function is becoming of lesser importance, since there is handled mostly frozen fish. The problem there is the cutting and portioning of large blocks of frozen fish.

Freezing—The surplus of fresh fish in landings from Baltic catches, and partly from the North Sea, is mainly frozen. These are the quantities above which it is possible to send directly for marketing. Also some special products are frozen in the ports, e.g. frozen salmon for export. Recently there has been established in large ports the practice of refreezing fish—the fish previously frozen aboard a fishing vessel and defrosted in the port for additional handling such as filleting of headed and gutted fish. This function is being subject to accurate analysis in the aspects of the exploitation of a modernized fishing fleet, landing mostly frozen fish.

Other processing—In the majority of fishing ports and fishing bases, the fish is processed into smoke-cured, marinated and canned fish. The general view is that processing plants, localized in fishing ports, should base their production on fresh fish, since only this fact justifies their localization in the ports.

Reduction of offal, fish, etc.—This includes fish meal factories in the ports and fish oil factories. A modern fish oil factory is situated in the port of Gdynia.

Storage—This is a complex problem. In cutter ports storage is provided for a short period of cumulation of landings of fresh fish in boxes, which is stored in separate handling halls and for longer periods of a few weeks for salt-herring in barrels, in cooled down cellars for the period of maturation. A different problem is presented by the storage of frozen fish in ports. While it should be a short storage period, in practice port cold stores assume the character of retention storage.

Other port functions

One of the important organizational tasks is a reasonable determination of port functions in co-ordination with operational cycles at sea and on land, with the object of achieving the best economical results. There are to be included the following additional functions of the port:

Maintenance of port exploitative efficiency— This is in charge of the owners, who are the administrators of fishing ports according to the principle of "one master in the port". Minor repairs and overhaul works are carried out by the owners repair brigade, subject to the port administration. Major repairs and overhaul are either performed by the owner's repair centre, which is an organizational unit of land repair facilities, or are done to order by specialized companies. The costs of port maintenance are covered by owners or by other users of the port, according to fixed rates.

Co-operation with various companies and institutions—Various functions are performed by different organizational units of the port administrator. The co-operation is carried out with the companies situated in the port and with those from outside the port. First we have mutual co-operation between fleet owners and ship-yards. The repair brigades of the ship-yard perform their tasks aboard owner's vessel in the fishing ports in the so-called continuous system of repairs as also the owner's repair brigades sometimes take part in the repairs carried out in the ship-yards, e.g. in order to speed up the repairs of the owner's vessel. The shipyards are as a rule situated outside the fishing ports, and thus while the vessels are there for repairs, the owners have more mooring space, which is not without advantage for port maintenace. Similarly co-operation is established with such companies as the Marine Radio Service and the Fishing Industry Cooling Mechanization Equipment Works, the company concerned with installation and repairs of cooling or freezing plants both on land and aboard vessels.

Specific co-operation between fishing and commercial ports—In case there is a congestion of cargo in the fishing port, the fish is discharged in commercial ports, particularly frozen fish. The ports assist each other through sending for temporary employment their stevedores and crane operators. Studies are carried out on seasonal differences in port traffic in order to find out how much assistance may be rendered by commercial ports, with their greater facilities, to fishing ports in those cases when there is a congestion of fishing vessels.

Transport services—The owner's transport service has also specific functions. Apart from internal port transport and a separate technical department which operates with other organizational units such as the trans-shipment department and department of supplies and workshops, the owners have their own fleet of vehicles operating between port and the hinterland of the fishing base, for transport to and from the stores of boxes, situated outside the port, and sometimes used for transport all over the country, e.g. for collecting supplies. In principle, the tendency is to centralize the transport service within respective regions of the country.

Servicing foreign fleets—The ports either have their own agents, or co-operate with agents' offices in organizing the service for foreign fishing vessels entering the ports. Payments are settled either in cash against established rates or through settlement of accounts for discharged fish.

Other maritime organizations—In some Polish fishing ports there are also situated companies not involved directly in the work of fishing ports, such as salvage companies, etc. The tendency is to eliminate them from the area of fishing ports, In some ports, besides state enterprises there are fishing co-operatives and private fishermen utilizing the port. They are confined to definite areas of the port and there they maintain complete management of their assigned area of the port, covering the whole complex of functions, or they co-operate with state enterprises. Here prevails the principle of "one master in the port" to eliminate duplication of functions. The private fishermen act as a rule under contracts made with the port administrators—they sell their fish catches and pay for the services, and in some cases they also purchase supplies from the port administration, e.g. ice, packings and boxes. The companies outside the port utilizing port facilities have to participate in the costs of port maintenance.

CHARACTERISTICS OF QUAYS AND PORT STRUCTURES

The port is a function of the ship. In turn—the port is primarily characterized by the dock and the quay; these are its fundamental indicators and its first link. The surface area, the depth of dock, and the type of quay determine both the maximum size of ship to call at the port, and the kind of fleet to utilize the port as a base—with a view to the best utilization of the costly port facilities. Thus we would have a different layout of docks and quays for a mixed type of fleet with different sizes of vessels and a different layout for a fleet of uniform type of ship.

Another essential question is the operational function of quays. There are two possibilities; specialization and flexibility. The general principle is to specialize those quays, or their sections, for which there is a warranty of full utilization, while in other cases flexibility yields better results.

While in deep sea fisheries ports there is an adequate depth of water, ranging from 7.5 to 10 m (25 to 33 ft), and suitable kinds of concrete quays, in the cutter ports the situation is mixed. There is the tendency, for better utilization of port facilities, to reserve some parts of the quays for fish discharge and repairs. The other sections of quays are of versatile character. In case of heavy fishing vessel traffic they are moored alongside. In some cutter ports, e.g. in Łeba as well as in particular fishing ports, the sections of the quays for mooring vessels are not permanent concrete structures, but only reinforced quays. The problem of quays involves their facilities and this includes the installation of cold and warm water for washing ship's holds, power, light, means of communication and loading facilities and cranes.

Selection of quays with their wide variety, construction methods and facilities is an economic problem worth careful calculation in view of high cost of building and exploitation of quays and docks. This involves the question of throughput capacity of the quays, being an essential element of capacity of the port as a whole.*

It is therefore a problem of correlation, of keeping correct proportions in all the links of port. The throughput capacity of particular objects and facilities determine the total capacity of the port. This throughput capacity is not a one-sided problem. It depends on many factors, on the type of vessels and the kind and destination of their cargo, the frequency of ships calling, and daily port traffic. The synchronization of port operations is therefore not an easy matter. Actual studies show that the smoothest operation is found in the versatile type of port.

In Polish ports and fishing bases there are the following facilities:

(a) Handling halls—utilized for short-term storage of fresh and salt fish which is handled, packed and prepared for transport. In some ports this handling is mechanized
(b) Cold stores for short-term storage, usually having freezing installations and block-ice factories with stores for ice and ice-crushing machines
(c) Fish meal factories (in Gdynia there is also a fish oil factory for medicinal and technical products)
(d) Repair workshops, owners' repair centres and, in some ports, docks or slips
(e) Net makers' shops, also net repairs works
(f) Packing and box stores. In some larger ports there are washing machines for cases and barrels and facilities for their repair
(g) Transport centres with a fleet of vehicles of various kinds
(h) Storehouses for deposited goods and supplies, for fuel; off-loading and handling yards
(i) Buildings for administration personnel and for social purposes
(j) Fuel stations
(k) In the majority of the ports there are also processing factories, e.g. canneries, smoke-curing kilns, etc., and among the many facilities: (i) railway sidings, (ii) net hoists for drying nets, (iii) weighing bridges.

Steady efforts are being made to introduce mechanization and the use of pallets in the ports.

The post-war plans of utilization of fishing ports provided for the supplementing of unavailable port facilities to make possible a proper service for fishing fleets stationed there. The aim was to smooth away, as far as possible, the differences in the maximum throughput capacity of particular facilities.

ORGANIZATION OF SERVICES

The differences in the services, described here, will depend upon the type of vessel and the kind of cargo.

The following are the main differences in servicing. The discharge of fresh fish in cases and salt fish in barrels, both from cutters and side-trawlers, is carried out by means of mobile quay winches, whereas frozen fish from factory-trawlers is discharged by means of cranes in the commercial ports or by the ship's winches. Iced fresh fish from side-trawlers is taken on deck in baskets and then poured upon mechanical conveyors.

The fundamental problem for the conventional fleet is prompt discharge of fish, mainly fresh, and the efficient delivery of ships supplies. The time in port between trips is, for conventional fleet, as follows: cutters, a few hours and trawlers, two to four days. For the modern fishing fleet, the time for repairs is restricted by the lay time in port between the trips, which is on average six days for side-trawlers, to 12 to 15 days for factory-trawlers. The organization of the lay time between trips is complicated particularly when many vessels call in port at the same time.

ORGANIZATION OF DISTRIBUTION

Following are the basic patterns of fish distribution:

(a) From vessel to distribution transport—
    (i) fresh fish by volume in containers
    (ii) frozen fish in cardboard boxes

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* This is a problem in itself and therefore is the subject of another contribution. A view of this question is given by Z. Polański: "Exploitation of fishing port" (in Polish), *Wydawnictwa Morskie*—Gdynia, 1967, Economic Study.

(b) From vessel to cold store—frozen fish and fish for freezing
(c) From vessel to handling and processing hall to distribution transport—fresh fish
(d) From vessel to processing hall to cold store—to distribution transport
(e) From vessel to stores or tanks—fish meal, fish oil.

The fish discharged from the vessel is weighed either in whole lots, e.g. fresh fish in cases, or by weighing a standard sample, e.g. salt fish in barrels, and sorted. This is the basis for settlement of accounts with crews, according to the so-called "share" system, and for determination of the amount of fish caught for further settlement of accounts and the estimation of the economic results of the fishing company.

Disposal of landings

The whole distribution of fish is subject to a centralized system of co-ordination through the Centrala Handlowa Zbytu Ryb (CHZR—trade central for fish sale) in Szczecin (formerly in Gdynia). This Central gets daily reports on the expected landings in particular ports and, the owners get orders for fish and addresses of destination. These orders are the basis for owners' instructions concering the handling of discharged fish. Fishing companies notify CHZR of fish lots ready for transport, and they are provided with road and rail vehicles. The control of fish is by the representatives of CHZR and the quality of fish, as declared by the owners, is checked usually by sample, by controlling staff who issue certificates. CHZR buys fish in the port delivered to railway car, and sells delivered to the station of destination. CHZR purchases all the production from owners including fish for processing in factories situated in the hinterland, and in turn sells it to processing factories or to specialized state marketing organizations, i.e. to the network of wholesale shops of fish centrals or grocers. CHZR is also responsible for accumulation, in state-owned cold stores and its own stores, of reserves of fish raw material to meet the even operation of processing factories, and for the accumulation of fish products for an even supply to the market.

Organization of fish marketing

The organization of the fish trade in Poland is based on the administrative division of the country. In every district (voivody) there is the wholesale shop of Centrala Rybna (Fish Central) with a network of retail shops, the number of which depends on the number of inhabitants in a given district. This is the fundamental framework of the system, co-operating with the network of grocers' shops, maintaining either "fish corners" within a regular grocer's shop, or separate fish shops, as a rule in those places in which there are no shops of Fish Central, and with the network of restaurants and other establishments serving meals to the public (sanatoria, holiday centres, etc.,) The sale of fish is done on the basis of uniform prices, established for particular zones. In this respect, Poland is divided into three zones according to the distance from the ports, and prices are subject to seasonal adjustments by the Competent Price Commission within, however, a definite range. The prices for fish are fixed by the State Price Commission and their level is related to family budgets, and correlated with the prices of other protein products, particularly meat. The quality of fish products is controlled both by the staff of experts from the Cenrtral Board of Fisheries, which is the body governing all the companies: owners, processing factories and trade companies, and by an independent agency: the State Trade Inspection.

All distribution of fish is based on contracts signed between the owners and CHZR and on the other hand between CHZR and the trade and processing companies. The general conditions of distribution are regulated by two important legal acts, the so-called General Conditions of Deliveries, and Trade (Fishery) Conditions of Deliveries. The cycle of distribution, from catch to retail shop, is correlated with annual plans and operational plans. Since 1967 direct contracts between fishing companies and fish centrals have been admitted, covering definite assortments of canned fish products to meet the demand in the market.

Since 1968 a regular scientific analysis of the fish market in Poland has been carried out by the Trade Centre of Market Research.

PROGRAMMING THE DEVELOPMENT OF PORTS

The programming of the development of the national economy is in charge of the Planning Commission of the Council of Ministers. This Commission establishes the main trends and the general course of development. The precise distribution of tasks among trade branches is carried out by the respective ministries; in fisheries it is done by the Ministry of Shipping, and the working out of details is performed by the respective fishing companies and institutions under the guidance of the Central Board of Fisheries. Thus the Minister determines the extension of ports, on the application of the director of the Central Board of Fisheries concerning ports under the administration of state fishing companies, and on the application of the Maritime Board, with the advice of the director of the Central Board of Fisheries, concerning the ports under state administration. For extension of ports exploited by co-operative fishing companies the application is submitted by the Maritime Board jointly with the National Union of Fishing Co-operatives. This concerns matters of docks and quays. Port investments are actually financed from state funds, i.e. from the central budget through the Ministry of Shipping. The building up of the background facilities of the ports and fishing bases is undertaken by their administrators. The investment regulations define the objects and financing. Thus some investments are financed by the Ministry, e.g. the cold chain, some by the Central Union of Work Co-operatives or by National Union of Fishery Co-operatives, and some minor ones by the port administrators. Bank loans may be drawn for investments yielding quick returns.

Two incentives provide the basis for planning development of ports:

(a) the pursuit of the proper economic utilization of existing ports and the modernization of existing facilities and buildings, including all necessary services in balanced proportions

(b) the extension of existing ports following the development of fisheries with increased demand for port services.

The development of fisheries is based on analysis and estimation of increasing needs of consumers and on the policy of the government to provide rational nutrition. In turn the needs in the range of protein products available from fisheries are evaluated in terms of amount of whole fish required and accordingly the selection of the necessary fishing fleet and fishing methods is made, and in turn, these determine the development and extension of ports and their facilities.

The decision-making process is based on the analysis of a variety of assumptions and conceptions, such as: whether the port is to be only a link connecting the sea (fleet) with the hinterland, i.e. the place at which sea transport is changed into land transport; whether fish handling and processing, e.g. filleting and portioning of fillets, freezing, canning, smoke-curing, etc., is to be carried out.

The extent of utilization of particular fishing ports is also analyzed for making decisions in respect of the proper location of the fishing fleet. As a rule the alternative is chosen which guarantees the best economic effects, or the most correct accomplishment of set tasks. In economic calculation, consideration is also given to the effect obtainable through the processes of modernization and by withdrawal of technical facilities still fit for operation, and not amortized. Economic calculation shows what results, inter alia, would be obtained by the premature withdrawal of a non-profitable fleet, as withdrawal of non-profitable vessels reduces economic losses since places are left in the ports for other more profitable vessels, thus rendering savings in investment. Factors of proper location of ports in relation to considerations of the location of the hinterland, and means of communication, railways, highroads and waterways. The best variant is then accepted for planning.

The study of the basic alternatives: the extension of existing ports or the building up of new ports. This kind of research is carried out in the first place by large institutions, such as The Designing Office for Maritime Structures "PROJMORS" in Gdańsk, the Head of Port Engineering of the Fishery Department of the High Agricultural School in Szczecin, the Sea Fisheries Institute in Gdynia, Maritime Institute in Gdańsk and the Chair of Industry Economics of the High Economic School in Sopot.

CONCLUSIONS

From the above considerations the following are the main economic problems in Polish ports:

(a) the determination of optimum throughout capacity, being the complex of means for servicing fleet and cargo, in order to achieve the best total effect of their operation
(b) the determination of the necessary functions of fishing ports, with the application of the principle of integration of functions and concentration of facilities
(c) the solution of the problem of specialization or versatility of ports, their mutual co-operation and co-ordination with background facilities, including the so-called cold chain
(d) introduction of technical and organization progress into the operation of fishing ports

Vigo: Algunos Aspectos de la Organización y Desarrollo de un Puerto Pesquero

por J. Pérez Bellod

Vigo: some aspects of the organization and development of a fishery port

The Vigo estuary with its privileged geographical situation and excellent natural conditions of depth and shelter is one of the world's largest natural ports.

The paper describes the origin of the fishing port of Vigo and its disposition as well as the type of fishing vessels based there, i.e. for high-seas fishing (semi-cured cod, frozen fish and whaling); sea fishing for products iced for direct human consumption and inshore fishing for local markets or processing.

A port description is included with an indication of how and by whom the services to the fishery fleet are provided.

The construction, maintenance and exploitation of the fishing port is in the hands of the Junta del Puerto y Ría de Vigo, a Government autonomous entity. There are, besides, other administrative bodies such as the Comandancia de Marina and Sanidad y Servicio de Trabajos Portuarios which have surveillance and control functions. Unloading of the fish as well as its auctioning, marketing and processing is done by private enterprise. The organization of unions and professional staff connected with the fishing, processing and marketing sectors of the industry is detailed, together with those of training institutions like the Escuela de formación Profesional Náutico-Pesquera and those for research such as the Instituto de Investigaciones Pesqueras and the Instituto Español de Oceanografía.

Good distribution channels and marketing, together with the study of potential markets for fishery products are essential for fisheries development planning and in this respect the problems encountered by Vigo when introducing frozen fish are described.

General criteria on the financial aspects of fishing ports and legislation affecting the Spanish ports, complete the paper. Finally, it includes general information on port tariffs and on the costs of services and supplies.

Vigo: quelques aspects de l'organisation et du développement d'un port de pêche

Vigo, situé au fond d'une ria qui lui assure une exceptionnelle situation géographique et d'excellentes conditions de profondeur et d'abri, est l'un des plus grands ports naturels du monde.

L'auteur expose l'origine du port de pêche de Vigo et son agencement, ainsi que les diverses catégories de navires de pêche qui y opèrent: grande pêche (morue semi-traitée, poisson congelé, chasse à la baleine), pêche hauturière débarquant des produits sous glace pour la consommation humaine directe, et pêche côtière alimentant les marchés locaux ou les industries de transformation.

La communication décrit les installations portuaires, en spécifiant le type et les fournisseurs des services assurés à la flotte de pêche.

La construction, l'entretien et l'exploitation du port de pêche relève de la Junta del Puerto y Ría de Vigo, organisme gouvernemental autonome. Il existe d'autres organismes administratifs, comme la Comandancia de Marina et Sanidad y Servicio de Trabajos Portuarios, exerçant des fonctions de surveillance et de contrôle. Le débarquement du poisson, ainsi que la vente aux enchères, la commercialisation et la transformation, relèvent d'entreprises privées. L'auteur traite de l'organisation des syndicats et des travailleurs spécialisés opérant dans les secteurs de la pêche, de la transformation et de la commercialisation, ainsi que du personnel d'établissements de formation comme l'Escuela de Formación Profesional Náutico-Pesquera et d'établissements de recherche tels que l'Instituto de Investigaciones Pesqueras et l'Instituto Español de Oceanografía.

Pour la planification du développement halieutique, il est indispensable de disposer de bons circuits de distribution et de commercialisation ainsi que d'étudier les débouchés potentiels pour les produits de la pêche. L'auteur décrit les problèmes auxquels on s'est heurté à cet égard à Vigo lors de l'introduction du poisson congelé.

La communication renferme en outre des renseignements d'ordre général sur les aspects financiers des ports de pêche et sur la législation intéressant les ports espagnols. Elle conclut par des données sur les redevances portuaires et sur le coût des divers services et fournitures.

GALICIA está situada en el NO. de la península ibérica en avanzada hacia el Atlántico y con una situación geográfica privilegiada frente a las más importantes rutas marítimas comerciales del mundo.

Es una región montañosa y siempre verde, con clima templado y costa bañada por la corriente del golfo, en la que se recortan numerosas rías entre las que destaca la de Vigo hacia el sur, próxima ya a la frontera portuguesea.

Condiciones físicas y naturales

No son las rías simples desembocaduras fluviales, que en todo caso en Galicia tendrían una importancia relativa por la proximidad de las cadenas montañosas a la costa y consiguiente pequeña longitud de sus ríos, sino accidentes geológicos singulares, producidos por el hundimiento de extensos valles costeros, ahora sumergidos en el mar.

La ría de Vigo tiene una longitud de más de 16 millas con anchuras variables entre 0,3 y 6,5 millas, y una superficie de 140 km^2 en gran parte con calados superiores a los 30 m. Es una ría limpia y naturalmente abrigada de los temporales del Atlántico por las Islas Cíes situadas en su desembocadura, que constituyen un gigantesco dique natural y la convierten en uno de los puertos naturales más amplios y seguros del mundo.

La situación geográfica de Vigo es verdaderamente privilegiada como base de operaciones para la explotación de los recursos del mar. Aunque la plataforma continental es en este litoral estrecha, las condiciones del medio acuático son adecuadas para el desarrollo de gran número de especies muy apreciadas en los mercados pesqueros, reuniendo su ría, junto a su natural riqueza, las condiciones necesarias para servir de partida hacia las singladuras pesqueras atlánticas más remuneradoras.

Pequeña historia pesquera

Estas condiciones favorables del medio marino, los amplios espacios abrigados y la profundidad de las aguas, tuvieron forzosamente que influir en los primeros habitantes de estas tierras, para fijar sus moradas en sus costas y buscar en el mar un alimento que tan generosa y abundantemente se les ofrecía.

Fig. 1. Puerto pesquero de Vigo—Dársenas de El Berbés.

Todos los núcleos habitados de la ría tienen preferente tradición pesquera, ligada a una complementaria actividad agrícola, con esa dualidad característica de los trabajos estacionales que todavía se mantiene en algunos de nuestros pequeños puertos.

La historia de la pesca en la ría de Vigo es la historia misma de la pesca. Tras las capturas directas y la utilización primitiva de flotadores formados con troncos macizos o huecos, la utilización de pequeñas embarcaciones a remo o a vela para la pesca litoral en el interior de las rías o en la plataforma continental próxima, ha continuado hasta nuestros días de manera tradicional, figurando las planas "gamelas" y las elegantes "dornas" como antiguas muestras de una vigorosa tradición.

La aplicación a los buques pesqueros, en la segunda mitad del siglo XIX, del motor a vapor, fué el primer gran paso para la modernización, y con la posterior adaptación para la utilización de combustibles líquidos y el empleo posterior de los diferentes tipos de motores marinos, la navegación a vela ha quedado prácticamente reducida a finalidades docentes o deportivas. En nuestros días, incluso las pequeñas gamelas y botes, dedicados a la pesca en aguas tranquilas, están provistas de motor o utilizan motores "fuera borda" para sus desplazamientos.

La sustitución de la madera por el acero en los cascos de los buques, que todavía no ha alcanzado a la mayor parte de la flota costera o litoral, la utilización de motores más potentes con menores exigencias de espacio, la mejora en las maniobras de los artes de pesca y en los sistemas de localización y de seguridad, han sido factores que han permitido a la pesca rapidez y sensibles progresos en los últimos años.

Finalmente, la aplicación económica de la técnica del frío a la pesca ha permitido dilatar los horizontes de os armadores pesqueros hasta los más lejanos caladeros, en condiciones favorables de rendimiento y rentabilidad.

Las industrias derivadas de la pesca, a nivel artesanal en los primeros tiempos, encuentran antecedentes en las rías gallegas, en las que se han localizado restos de primitivos "pilos" que se utilizaban en los años 1.000 a 8.000 a de J. C. para la conservación del pescado, siendo en época romana muy floreciente en estas costas la industria de la "salazón" del pescado, con un comercio activo de pescado salado con Roma.

Iniciada la industria conservera en Francia a principios del siglo XIX, se extiende muy pronto a la región gallega en la que aparecieron las primeras fábricas de conservas de la península.

Factores que han influido en el desarrollo pesquero de Vigo

Junto a las condiciones naturales de la ría de Vigo, su posición geográfica privilegiada y los sucesivos avances que, como indicamos anteriormente, se han producido en la construcción de los buques pesqueros y en los métodos de conservación e industrialización de la pesca, han influido decisivamente en el desarrollo pesquero de Vigo los siguientes factores:

(a) La existencia de una tradición familar que, con conocimiento del negocio pesquero, ha canalizado importantes inversiones hacia este sector de la producción, en una ciudad con gran potencial de desarrollo.

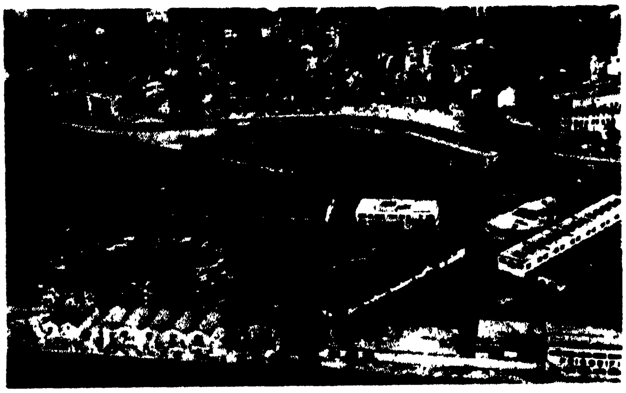


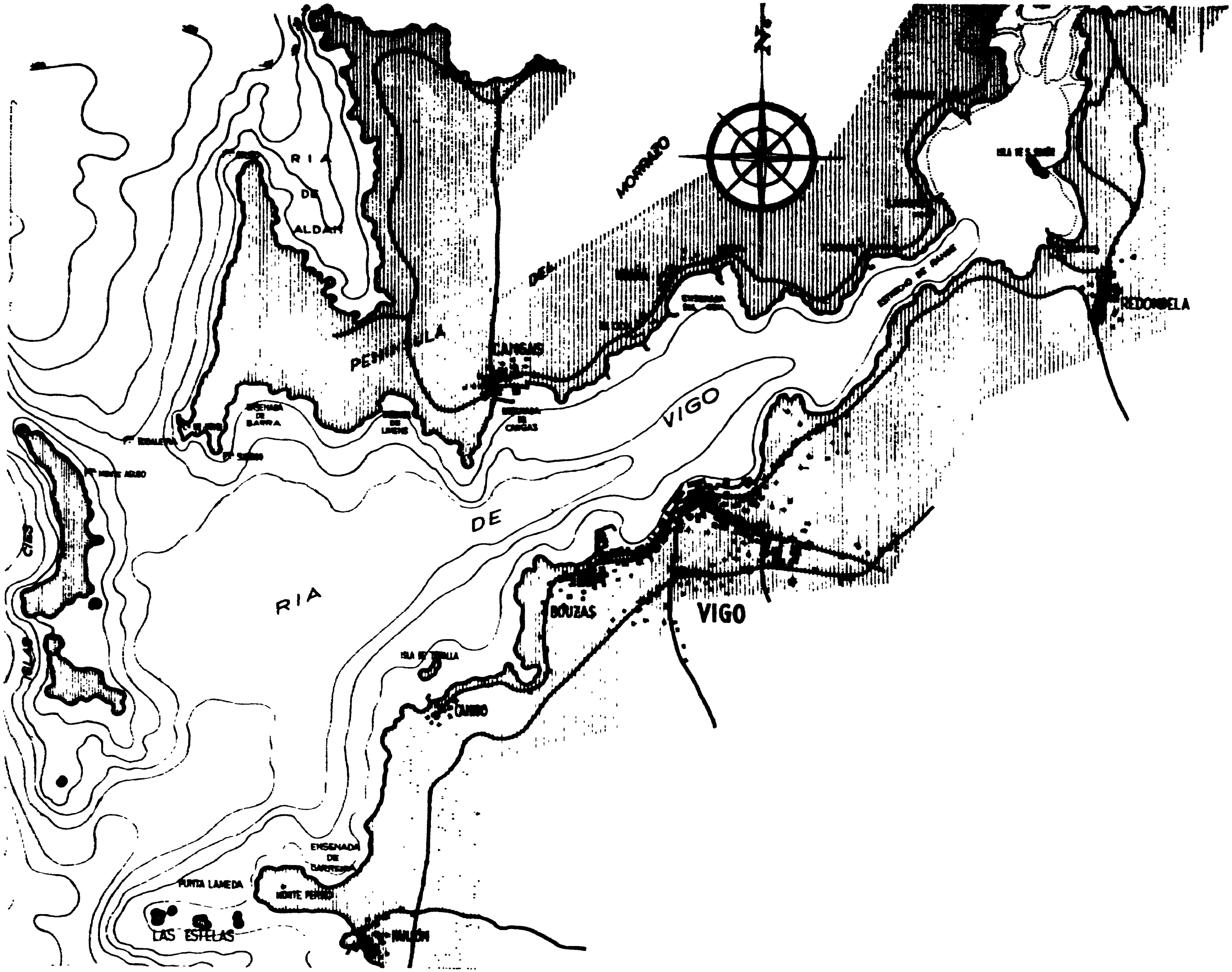
Fig. 2. Vista general de las dársenas núms. 1 x y 3 de El Berbés.

(b) Un importante núcleo de pescadores y gentes relacionadas con el mar que constituyen excelente mano de obra especializada.

(c) El establecimiento de comunicaciones rápidas con el interior del país, al resultar Vigo terminal de una de las líneas radiales de carretera y ferrocarril de primer orden.

(d) La creación de una amplia red de industrias derivadas de la pesca; en un principio de salazones, más adelante conservera y reductora, y posteriormente frigorífica de congelación y conservación.

(e) Una organización comercial dedicada a la adquisición y posterior distribución de los productos pesqueros.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PUNTA LAMEDA
LAS ESTELAS
ISLAS CIES

Fig. Ria Vigo.

(f) Gran número de varaderos y talleres dedicados a reparaciones de buques pesqueros que garantizan la continuidad del trabajo, y fuentes adecuadas de avituallamiento y pertrechamiento.

(g) Una importante industria de construcción naval especializada en la construcción de buques pesqueros de todas clases, y en constante esfuerzo técnico para la mejora de buques y métodos de pesca.

(h) La existencia de una Autoridad Portuaria creada en 1881 —Junta de Obras del Puerto—que con representaciones pesqueras ha canalizado las ayudas gubernamentales para la realización de las obras portuarias y la prestación de los servicios públicos generales que en cada momento fueron necesarios, ofreciendo terrenos adecuados a las empresas privadas para la instalación de industrias relacionadas con la pesca.

Elección del emplazamiento del puerto pesquero

La elección del emplazamiento de un puerto pesquero absolutamente nuevo en zonas sin tradición pesquera, es problema poco frecuente aun en países subdesarrollados, ya que nos encontraremos con ciertos núcleos de pescadores, y con tradiciones locales indispensables, que serán un decisivo factor en el futuro éxito de las nuevas instalaciones.

Prescindiendo del puerto pesquero nuevo creado como organización o empresa gubernamental, el caso general contempla situaciones actuales determinadas que proporcionan variadas perspectivas para la elección de emplazamientos.

Los diversos núcleos pesqueros, tradicionalmente existentes en la ría de Vigo —Cangas, Bayona, Moaña, Redondela— eran otras tantas posibilidades de emplazamiento de un gran puerto pesquero y del correspondiente centro de comercialización, y fueron los factores indicados en el epígrafe anterior los que condicionaron su emplazamiento a través del tiempo como una consecuencia natural de su desarrollo pesquero.

Las obras portuarias se iniciaron a principios del siglo actual, pero no fué hasta 1926 en que, estudios realizados por una Comisión especial, determinaron las condiciones generales que debía reunir el puerto pesquero de Vigo, redactándose un plan general de obras, todavía hoy en ejecución, del que el grupo principal, que corresponde a las dársenas de El Berbés y en el que se incluye el mercado terminal pesquero, fue inaugurado en el año 1950.

Se ha creado de esta forma un gran centro de comercialización en el que se concentran, las descargas, las ventas y preparación de las expediciones del pescado hacia los mercados o industrias consumidoras. Las ventajas que esta concentración supone para los armadores de los buques las facilidades de todo orden que obtienen y la seguridad de obtener el mejor precio para su pescado, han convertido al puerto pesquero de Vigo en mercado de toda la flota de la ría y, en ocasiones, de otras flotas forasteras, quedando los restantes puertos de la ría como bases de refugio, estancia y reducido pertrechamiento de las flotas de las pequeñas embarcaciones tradicionales dedicadas a la pesca litoral.

Panorama actual y previsiones futuras

Desaparecida prácticamente la navegación a vela en los buques pesqueros y el uso del carbón por el acondicionamiento de las calderas de las máquinas de vapor para el empleo de combustibles líquidos, los nuevos buques pesqueros, con cascos de acero y motores marinos, han aumentado su tonelaje como consecuencia de la introducción del frío industrial en la conservación de la pesca.

Los productos de la pesca que debían ser consumidos con rapidez, porque su período de conservación con hielo era muy limitado, al ser sometidos a un proceso adecuado de congelación permiten su almacenamiento y conservación duranto largo tiempo, y su posterior consumo en condiciones muy semejantes a las que tenía recién pescado.

Si con la utilización del hielo y mezclas frigoríficas se hizo posible alcanzar áreas de pesca alejadas de los puertos de descarga con la seguridad de que el pescado llegaría al mercado en buenas condiciones, con la aplicación del frío industrial y la congelación a bordo de los buques pesqueros, se consigue la posibilidad de alcanzar los caladeros más remotos, condicionando la vuelta del buque a su base, desde el punto de vista técnico, únicamente a la capacidad de almacenamiento en el buque de la pesca capturada. El obligado aumento de las dimensiones de los buques permiten dilatar el regreso a los puertos de origen, y evitar una considerable pérdida de tiempo en viajes, con un aumento considerable del rendimiento.

Las características del pescado congelado permiten liberar su comercialización de la servidumbre de la obligada venta en subasta después de la descarga que pesaba sobre el pescado fresco conservado en hielo. El almacenamiento, en cámaras frigoríficas, del pescado congelado, introduce en su comercialización la transacción directa entre armadores propietarios y mayoristas, sin otra regulación que las leyes generales de la oferta y la demanda, en función de los consumos previsibles y de los stocks de pescado almacenados.

El impacto que en unos pocos años ha supuesto la formación en Vigo de una importante flota de barcos pesqueros congeladores, cuya construcción ha supuesto un esfuerzo financiero considerable de la empresa privada y de la ayuda crediticia gubernamental, han frenado el desarrollo de la flota tradicional —parejas, bous, trawlers, bacas— provocando incluso el desguace de los buques más antiguos y menos productivos. Este fenómeno de carácter coyuntural tiene forzosamente que tener escasa duración, ya que el pescado fresco no ha sido desplazado por el pescado congelado, que se ha abierto mercados propios, sino que su demanda se ha mantenido y aumentado, como consecuencia del aumento del nivel de vida, incrementándose sensiblemente los precios de subasta, y ampliándose los sectores consumidores.

La flota pesquera dedicada a la pesca litoral es la de mayor antigüedad, conservándose gran número de motoras y traineras con casco de madera, de muy poca autonomía y escaso rendimiento. Estas características y la tradicional pesca con artes de cerco o aparejos que realizan, obligan a que sus actividades se desarrollen estacionalmente con largas etapas de inactividad por el alejamiento de los bancos de pesca de las áreas costeras próximas, o por los temporales que no están en condiciones de soportar.

Las tendencias actuales que permiten una previsión futura de necesidades son, en el puerto de Vigo, muy semejantes a las que se observan en otros puertos pesqueros occidentales

Los armadores deben suministrar a los proyectistas navales los datos fundamentales que le permitan construir el buque más adecuado. La determinación previa del tamaño del buque y de su capacidad de almacenamiento de pescado, permitirá al proyectista la fijación de su desplazamiento y de las dimensiones principales de eslora, manga, calado y franco bordo.

Las diferentes facetas pesqueras del puerto de Vigo implican la utilización de sistemas de pesca y buques también de características diferentes, en relación con la situación de los caladeros utilizados y de los tipos de pesca capturados.

Los caladeros más alejados, actualmente utilizados para la pesca de arrastre, son los de Africa del Sur, con distancias del orden de 5.000 millas, estimándose la posibilidad de utilización de caladeros más alejados tanto en el Atlántico SO como en el Indico y Pacífico. Los buques dedicados a esta clase de pesca disponen al menos de instalaciones para la congelación del pescado y cámaras refrigeradas para su almacenamiento, y en su mayor parte dispositivos mecánicos especiales para facilitar el izado de las redes cargadas, y la preparación y transporte interior del pescado. Son muy frecuentes los dispositivos de "rampa por popa". Son buques de 50 a 120 metros de eslora y 500 a 3.000 T.R.B. mangas de 8 a 15 metros y capacidad de carga de 250 a 2.500 Tm., utilizándose buques de menores dimensiones para la captura de algunos crustáceos de elevado precio. En todos estos buques el acondicionamiento incluye la congelación rápida a –30° C y la conservación a –20° C.

El aprovechamiento integral de la pesca se consigue en los buques mayores con instalaciones para corte y fileteado, obtención de harinas y aceites de subproductos o de las especies inferiores capturadas, e incluso fabricación de verdaderas conservas. Se llega de esta forma a verdaderos buques factoría, que pueden, a su vez, dedicarse a la pesca o utilizar los productos capturados por buques más pequeños.

Tanto los buques pesqueros congeladores como los buques factoría, en sus diversas modalidades, pueden aumentar sus rendimientos utilizando buques mercantes frigoríficos o simplemente cargueros, para remitir a los puertos receptores el pescado congelado y las harinas, aceites o conservas, realizando transbordos en alta mar, en sus fondeaderos habituales o en puntos próximos a los caladeros, e incluso en algunos casos, previo depósito provisional en almacenes portuarios adecuados. Aunque los buques deben volver a sus bases para realizar reparaciones y revisiones periódicas y facilitar descanso a su tripulación, estos viajes pueden reducirse al mínimo utilizando instalaciones portuarias, próximas a las áreas de pesca explotadas, habiéndose llegado incluso a organizar turnos de trabajo para las dotaciones del buque, utilizando el transporte aéreo para los desplazamientos entre Vigo y Sudáfrica.

Los caladeros a distancias medias, del orden de 500 a 1.500 millas que, en razón de la duración del ciclo de la pesca, permiten la conservación del pescado únicamente con hielo, utilizan buques tradicionales con casco de acero de 30 a 50 metros de eslora y 200 a 500 T.R.B. Los avances técnicos en estas unidades, cuya renovación se encuentra momentáneamente frenada por la concentración indicada de la capacidad inversora hacia los buques congeladores de gran altura, se caracteriza también por la introducción de las rampas a popa y otros dispositivos encaminados a racionalizar y mecanizar las maniobras de lanzar y cobrar los aparejos y la preparación y almacenamiento del pescado, así como el acondicionamiento de las bodegas para conservar pescado fresco con hielo a 0° C. Estas mejoras técnicas se introducen igualmente en los buques semi-factorías, dedicados a la pesca del bacalao en el Atlántico norte, que limpian y salan el pescado en la mar, para su transporte, y que, descargado en puerto con el nombre de "bacalao verde" pasa a las factorías en tierra para completar su secado y curado. Se consigue, de esta forma, una disminución de la contribución del factor humano en la manipulación a bordo, reduciéndose el número de tripulantes, y una mayor rapidez y seguridad en las operaciones, con un mayor rendimiento en cantidad por campaña y hombre, y una mejora en la calidad del pescado. También en este grupo se tiende a la utilización de buques congeladores de pequeñas dimensiones, de unos 30 a 40 metros de eslora y 200 T.R.B., e incluso buques mixtos con posibilidad de conservar pescado fresco o congelado en proporciones variables según la situación del punto base respecto al caladero frecuentado.

La misma tendencia modernizadora se observa en los buques dedicados a la pesca costera o litoral con artes pelágicas de cerco o aparejo, porque, como se indicó anteriormente, la flota existente es muy antigua, y los viejos buques de madera, que raramente alcanzan esloras de 20 metros son poco rentables por su escasa autonomía y elevado número de marineros necesarios, unido a las forzadas etapas de inactividad. Los nuevos buques con casco de acero, mayores dimensiones y velocidad, y mecanización de las operaciones, y mejor acomodación para el pescado, permitirán campañas más dilatadas y desplazamientos a mayor distancia del puerto base en seguimiento de los bancos de pesca en sus desplazamientos migratorios o en la búsqueda de otros bancos más propicios. También en este sector, y por análogas razones que en la pesca de arrastre, se tiende a la construcción de buques con instalaciones para la congelación del pescado y su posterior conservación, en relación con el tamaño del buque y la situación de las zonas de pesca.

Es frecuente la construcción de buques "polivalentes", que completan su trabajo durante el año alternando, según las épocas, la pesca con aparejos, o artes de cerco, con la pesca de arrastre en aguas medias o profundas.

En todas la nuevas construcciones se cuida especialmente de mejorar las condiciones de habitabilidad del buque, dando singular importancia a la acomodación de la tripulación, de forma que las mayores comodidades ayuden a compensar la dureza de su trabajo, y el obligado y, en ocasiones, dilatado alejamiento de sus hogares particulares; los buques de mayor tonelaje pueden ya disponer de servicios médicos y religiosos para el personal, tendiéndose a que estos servicios puedan prestarse a buques menores desde buques especiales de ayuda, situados en caladeros frecuentados por un número de barcos importante.

Tipos de pesca

Como resumen de lo indicado en los párrafos anteriores, concurren en el puerto pesquero de Vigo los siguientes tipos de pesca:

Pesca de gran altura que comprende:

(a) Pescado congelado, suelto, en cajas o en bloques, transportado a puerto en transportes frigoríficos, o en los mismos buques pesqueros que realizaron su captura. Las dimensiones de estos buques pesqueros suponen esloras totales de 30 a 120 metros, y calados máximos de 3,50 a 6,50 m. Los buques mercantes frigoríficos utilizados, tienen dimensiones muy variables, y análogamente sucede con los buques factoría que, frecuentemente, proceden de antiguos buques mercantes habilitados

(b) Harina en bolsas o sacos, aceite en barriles y conservas en cajas, transportados en los indicados buques pesqueros, frigoríficos o factoría

(c) Bacalao salado a media cura —bacalao verde— transportado a granel o en cestos especiales en las bodegas de los buques pesqueros

(d) Ballenas y cachalotes que se descargan en la factoría particular de "La Balea", situada en la costa norte de la ría, junto al puerto de Cangas.

Pesca fresca de altura—Transportada a granel y sin clasificar, o con una ligera clasificación en las bodegas de los buques pesqueros, con hielo, y colocada con separaciones de madera (panas) verticales y horizontales, con el fin de evitar que el peso de la carga aplaste el pescado de las capas inferiores. Los buques con esloras de 30 a 50 metros tienen calados no superiores a 4,50 m.

Se trata, en general, de pescado variado procedente de la pesca de arrastre, destinado al consumo inmediato "en fresco", aunque suelen descargarse igualmente—cefalópodos —choco y pulpo— destinados a la congelación o a la conserva, u otras especies destinadas a la fabricación de conservas o a las industrias reductoras.

Pesca costera o litoral— Entre la que distinguimos:

(a) Pescado de características uniformes, transportado a granel y destinado en pequeña proporción al consumo "en fresco" y en su mayor parte a su industrialización para la fabricación de conservas o salazones (sardina, albacora, anchoa, bonito, palometa, etc.) harinas o aceites. Los buques pesqueros utilizados tienen hasta 20/30 metros de eslora y calados no superiores a 3,00 m.

(b) Pequeños lotes de pescado variado y mariscos, capturado por pequeñas embarcaciones a motor o a remo, utilizando aparejos o artes de pesca de varias clases, que se destina, en general, al consumo de los mercados locales

(c) Moluscos (almejas, berberechos, ostras, mejillones, vieiras, etc.), procedentes de yacimientos naturales o viveros flotantes, destinados, tanto a la exportación para consumo en fresco, como a la fabricación de conservas.

Descripción general del puerto

Con carácter general, es conveniente que los puertos pesqueros sean independientes de los puertos comerciales, o al menos, que las instalaciones pesqueras de un puerto estén completamente aisladas y diferenciadas de las restantes instalaciones destinadas al tráfico de pasajeros y mercancías. Solo en muy pequeños puertos pueden simultanearse el tráfico pesquero y el comercial, pero contando siempre con una adecuada distribución de los muelles a instalaciones disponibles entre ambas atenciones. Dentro del puerto pesquero, es también conveniente, al igual que sucede en los sectores comerciales, la especialización de las diferentes zonas, muelles e instalaciones, según la finalidad de su utilización, y los servicios que por los mismos se presten.

El puerto pesquero de Vigo se extiende en una longitud de costa superior a 3 km entre dos antiguos núcleos pesqueros, El Berbés y Bouzas. Comprende fundamentalmente las cuatro dársenas de El Berbés, con una superficie total de 13,4 has. (134.000 m^2), las dos dársenas de Bouzas con 5,5 Has. (55.000 m^2) de superficie de flotación y una zona industrial pesquera, situada entre los dos núcleos anteriores, cuya superficie abrigada al terminarse el dique de abrigo de Coya, en construcción, será de 70 Has. (700.000 m^2), y en la que existen cinco pantalanes o espigones y varias rampas frente a la zona ocupada por factorías pesqueras y almacenes frigoríficos.

En la ría, y dependiendo de la Junta del Puerto de Vigo, existen varios pequeños puertos pesqueros —Cangas, El Con-Moaña, Domayo, Cesantes y Canido—, que sirven de base a buques destinados a la pesca costera, y un conjunto de embarcaderos y rampas, realizándose en todos éllos operaciones simultáneas de tráfico de bahía, de pasajeros y mercancías con el puerto de Vigo.

Aunque la ría está abrigada de los temporales del Atlántico, los diques de abrigo construidos en los puertos pesqueros tienen como objeto garantizar una perfecta tranquilidad de las aguas, respecto a las pequeñas agitaciones interiores, para que los buques pesqueros de menor tamaño se encuentren completamente seguros y realicen sus operaciones en cualquier estado de agitación exterior.

En muchos parajes de las costas de la ría existen muelles, rampas o espigones de propiedad particular, para servicio de fábricas de conservas y factorías pesqueras.

Servicios generales al buque

Los buques precisan, en primer lugar, superficies abrigadas y además obras de atraque, para realizar sus operaciones de descarga de la pesca, suministros, pertrechamientos y avituallamiento, estancia y descanso, y revisiones y reparaciones. No puede, sin embargo, olvidarse que la eficacia del puerto pesquero depende, en gran parte, de las condiciones y mecanización de los buques que lo utilizan.

Hemos indicado las superficies abrigadas en todo tiempo de que se dispone, y a continuación reseñamos la distribución de muelles y servicios.

Muelles de descarga—Las dársenas No. 1 y parte de la No. 3 de El Berbés, están destinadas a las descargas de la pesca litoral, de la que, gran parte, se descarga también en

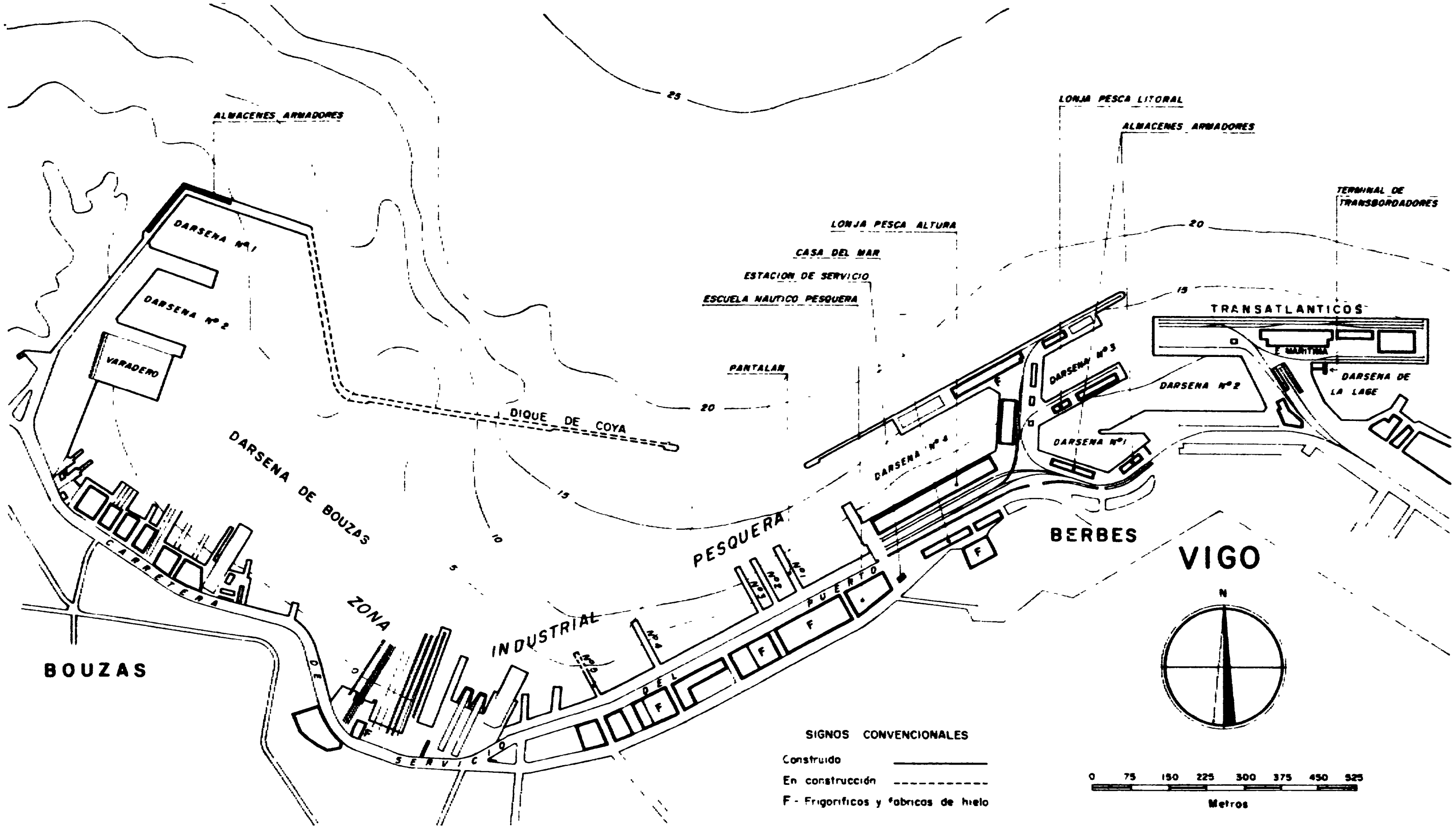
ALMACENES ARMADORES
DARSENA Nº 1
DARSENA Nº 2
VARADERO
DARSENA DE BOUZAS
DIQUE DE COYA
BOUZAS
CARRETERA DE SERVICIO DEL PUERTO
ZONA INDUSTRIAL PESQUERA
Nº 1
Nº 2
Nº 3
Nº 4
Nº 5
F
25
20
15
10
5
PANTALAN
ESCUELA NAUTICO PESQUERA
ESTACION DE SERVICIO
CASA DEL MAR
LONJA PESCA ALTURA
LONJA PESCA LITORAL
ALMACENES ARMADORES
TERMINAL DE TRANSBORDADORES
TRANSATLANTICOS
E. MARITIMA
DARSENA Nº 4
DARSENA Nº 3
DARSENA Nº 2
DARSENA Nº 1
DARSENA DE LA LAGE
BERBES
VIGO
N
SIGNOS CONVENCIONALES
Construido
En construcción
F - Frigoríficos y fabricas de hielo
0 75 150 225 300 375 450 525
Metros

Fig. 4.

los numerosos muelles y rampas, tanto públicos como privados, existentes en las costas de la ría.

La dársena No. 4 de El Berbés está, en su mayor parte, destinada a la descarga de pescado fresco variado, tanto de altura como procedente de "arrastre" en las zonas costeras próximas

La captura del "bacalao verde" o a media cura, tiene un ciclo de pesca de 4½ a 5 meses, por lo que la llegada a puerto de los bacaladeros tiene lugar dos veces al año —junio y diciembre— y las descargas se realizan en el espigón que cierra por el Sur la dársena No. 4 y en los pantalanes No. 1 al 4 de la zona industrial.

El pescado congelado, que cuando va destinado a frigoríficos situados en la zona industrial, se puede descargar tambien en los indicados pantalanes que se están reforzando para habilitarlos para este fin, suelen, en la actualidad, descargarse en los muelles comerciales, especialmente si es transportado en buques frigoríficos, que precisen reducir al máximo sus días de estancia en puerto.

Las ballenas y cachalotes se descargan en la factoría de "La Balea", que dispone de rampa de varada e instalaciones para la completa industrialización de sus productos.

Suministros—Los suministros principales a los buques pesqueros son los siguientes:

(a) **Combustibles:** La mayoría de los buques utilizan gas-oil, aunque hay todavía buques que queman fuel-oil en sus viejas calderas de vapor, mientras que el carbón como combustible ha desaparecido. El suministro lo realiza la empresa oficial C.A.M.P.S.A., en régimen de monopolio nacional, con precios especiales reducidos para la pesca, en cantidades controladas por los servicios de la Administración (Comandancia de Marina). Los cupos están relacionados con el tonelaje y zona de pesca del buque.

El suministro se efectúa directamente en el muelle N. de la dársena No. 4, en los pantalanes No. 1, 2 y 4, en el pantalán de petroleros, o "a flote" por medio de petroleros dedicados exclusivamente a este servicio. Se comprende la conveniencia de que este suministro se realice, bien por tierra o por mar, simultáneamente a las restantes operaciones preparatorias que efectúa el buque antes de una nueva salida a la mar.

Por la Junta del Puerto se han facilitado terrenos para la construcción de depósitos de combustible, tanto en Vigo como en los pequeños puertos de Cangas, Moaña y Cesantes

(b) **Agua dulce:** El suministro para calderas de vapor y usos domésticos a bordo, se realiza por la Junta del Puerto mediante contador, por tomas situadas en los muelles de descarga o de estancia, mientras se realizan dichas operaciones, o por barcos algibes particulares

(c) **Hielo:** Existen cinco fábricas privadas, en su mayoría en la zona portuaria, para fabricación y suministro de hielo picado o en escamas, a los buques que se dedican a la pesca litoral y de altura, con una capacidad de producción de 240.000 Tm anuales, y de almacenamiento de 6.000 Tm. Este almacenamiento es imprescindible para regular el suministro en los meses estivales de mayor consumo.

La carga del hielo en los buques se debe realizar momentos antes de su salida del puerto, y el suministro se efectúa por torres de distribución situadas en el muelle N. de la dársena No. 4 y pantalanes No. 2, 3 y 4. La situada en la dársena No. 4 tiene carácter esencialmente público, de acuerdo con la concesión que autorizó su construcción, y una capacidad de suministro de 80 Tm/hora. Las restantes instalaciones suministran especialmente a los buques de su grupo pesquero, y eventualmente a otras embarcaciones ajenas. En algunas circunstancias estas fábricas transportan, con camiones, el hielo preparado a muelles de estancia y avituallamiento para su entrega directa al buque

La cantidad de hielo necesaria para pesca de altura es, por término medio, igual al tonelaje de pescado capturado, y mucho menor la proporción para la pesca litoral, tanto con artes de cerco como de arrastre, por la menor duración del ciclo pesquero del buque

(d) **Sal:** El consumo principal lo realizan los buques dedicados a la pesca del bacalao en navegación de gran altura. Estos buques precisan cantidades importantes del orden de 200 Tm. por buque, y se suministran en los muelles comerciales cargando con grúa, o en estos muelles o los destinados a estancia y avituallamiento, directamente por medio de camiones y cintas.

Muelles para estancia, avituallamiento y pequeñas reparaciones. Los muelles de las dársenas No. 1 y 4 de El Berbés, destinados a la descarga del pescado o suministros deben quedar libres inmediatamente después de realizadas las operaciones, e igualmente sucede con los pantalanes en las épocas de descarga de bacalao verde o pescado congelado.

Los buques pesqueros después de finalizadas las descargas, deben permanecer un cierto tiempo en puerto antes de su próxima salida. Según la duración de su ciclo pesquero, este período es más o menos largo: desde unas pocas horas para los buques dedicados a la pesca litoral que pueden quedar aumentadas por los domingos y días festivos, que permanecen inactivos, hasta dos o tres días en los buques dedicados a la pesca de altura, con un ciclo de pesca de 20 días a un mes. Estas estancias tienen como finalidad, el descanso de los marineros, la carga de suministros y vituallas, el pertrechamiento (artes de pesca, aparejos, cables y estachas, aparatos, repuestos y demás efectos navales) y la pequeñas reparaciones usuales. Estas reparaciones o las convenientes revisiones periódicas, pueden dilatar la estancia normal de los buques en puerto.

Los buques dedicados a la pesca de gran altura (bacaladeros y congeladores) cuyos ciclos de pesca son más dilatados, pueden estar en puerto, después de terminadas las descargas, de diez días a un mes, e incluso períodos más dilatados, según la duración de las operaciones de conservación y reparación, que sean necesarias.

Debemos contar, además, con los buques inactivos por diversas causas, tanto periódicas, como sucede con los buques dedicados a la pesca litoral al finalizar las compañas, como financieras o sociales, e incluso cuando, a causa de fuertes temporales, son arriesgadas las faenas de la pesca. Estos buques pueden abarloarse a otros buques atracados a muelles, e incluso fondear en las superficies abrigadas, siempre que no dificulten la navegación.

Para todas estas necesidades que precisan servicios semejantes, se dispone de los muelles siguientes: Para la flota de altura y gran altura, los muelles N. y O. de la dársena No. 3 de El Berbés y los de las dársenas No. 1 y 2 de Bouzas, utilizándose también los cinco pantalanes de la zona industrial que, por su situación frente a determinadas factorías pesqueras, y aunque sin exclusividad son perfectamente utilizados por los buques que de éllas dependen, simultaneando operaciones de descarga, suministro y pertrechamiento, e incluso, si es posible, de estancia y pequeñas reparaciones.

Para la flota litoral se utilizan el muelle N. de la dársena No. 1 y el Sur de la dársena No. 2 de El Berbés, así como los muelles de los restantes puertos pesqueros de la ría que, como hemos indicado, sirven de base a flotas costeras locales. Tanto en el puerto de Vigo como en otros puertecillos de la ría, existen rampas para el varado, calafateado y reparación de las embarcaciones menores.

El resumen de los muelles del puerto pesquero de Vigo es el siguiente:

	M.1	*Calado B.M.V.E. M.*
Para descargas	1.204	2.-/7.-
Para suministros	201	6.-/7.-
Para estancia, avituallamiento y pequeñas reparaciones	1.650	2.-/7.-
Pantalanes de uso vario. (4 de 100 m de longitud, con dos frentes de atraque)	800	3.-/7.-
(1 de 35 m, id. id.)	70	2.-/4.-
TOTAL	3.925	

Construcción, armamento y grandes reparaciones. En la zona marítima bajo la jurisdicción de la Junta del Puerto, se han concedido autorizaciones para la construcción, por la industria privada, de numerosas industrias destinadas a la construcción y reparación de buques, que comprenden, astilleros, varaderos, talleres y muelles de armamento. Las mayores de estas industrias atienden simultáneamente a la construcción y a la reparación de buques.

Existen en la actualidad tres grandes astilleros, otros cuatro intermedios, seis astilleros y varaderos menores y otras muchas industrias semejantes dedicadas a construcciones y reparaciones de buques de madera. En total más de 80 gradas y rampas de varios tipos y dimensiones.

Los astilleros vigueses están a la cabeza de los de su clase para la construcción de buques pesqueros, con instalaciones y métodos modernos de prefabricación, que les permiten construir en las mejores condiciones de calidad y precio, destinando a la exportación una importante proporción de sus construcciones.

Cuando no interfieren sus tráficos característicos, la Junta del Puerto permite la utilización de algunos de sus muelles pesqueros o comerciales, para armamento y reparación de buques pesqueros, por insuficiencia temporal de los muelles de armamento privados, disponiendo en los mismos de instalaciones eléctricas adecuadas.

Servicios complementarios al buque pesquero. En los muelles destinados a estancia, pertrechamiento y pequeñas reparaciones, se facilitan por la Administración portuaria —Junta del Puerto— a los armadores, almacenes, individuales para facilitar el desarrollo de sus actividades, en relación especialmente con el depósito de artes y aparejos de pesca, pertrechos, repuestos y otros, pequeña oficina, e incluso con zonas especiales para la preparación y cebado para la pesca de palangres y otros aparejos semejantes.

La Junta ha facilitado terrenos en la zona portuaria para la construcción de talleres mecánicos, eléctricos y de carpintería naval, almacenes de efectos navales, fábrica de redes y malletas, y otras instalaciones complementarias para la preparación del buque pesquero.

Servicios generales a la pesca

Para mayor claridad en la exposición, y por corresponder efectivamente a una diferenciación que realmente se produce, enumeramos separadamente los servicios que precisan los tres tipos de pesca indicados —gran altura, altura y litoral o costera— y la forma como se prestan en el puerto de Vigo.

Pesca de gran altura—Como hemos indicado, está formada por bacalao "verde" o a media cura, por pescado congelado —en piezas sueltas, bloques o cajas— y por productos derivados de la pesca —aceites, harinas, conservas— procedentes de barcos factoría—y por ballenas y cachalotes remolcados.

Como factores principales que deben considerarse para la descarga y transporte figuran: la rapidez, la economía y la preservación de la calidad de los productos de la pesca.

El establecimiento de una cadena contínua entre el buque y la factoría pesquera o el almacén frigorífico, puede resultar de la máxima eficacia en relación con los tres factores indicados.

La ubicación de las factorías y almacenes frigoríficos en zonas inmediatas a los puntos de atraque, y la construcción de instalaciones contínuas de descarga, a ser posible, cubiertas y climatizadas des de la bodega del buque al frigorífico, constituyen una solución excelente, limitada únicamente por razones económicas de rentabilidad de la instalación en relación con el volumen previsto de las descargas.

La habilitación de los pantalanes situados en la zona industrial pesquera de Vigo está encaminada a conseguir esta finalidad, cuyas mayores dificultades se derivan de la dispersión de las factorías y frigoríficos en la zona portuaria. En la actualidad la descarga en estos pantalanes, tanto del bacalao verde como del pescado congelado, se realiza por medio de maquinillas tradicionales, y en fecha inmediata podrán utilizarse grúas automóviles para conseguir un mayor rendimiento —rapidez y economía—

completándose en ambos casos el transporte por medio de carretillas transportadoras diesel o eléctricas, con el uso exclusivo de éstas en el interior de las cámaras frigoríficas. Una segunda etapa la constituye la instalación de la cadena contínua de transporte desde la bodega del buque.

En general, cuando el pescado congelado llega a puerto en los buques pesqueros que realizaron las capturas, no es la rapidez, desde el punto de vista del barco, un factor decisivo, por estar prevista una determinada estancia del mismo en puerto o por otras razones, pero cuando el pescado es transportado en buques frigoríficos mercantes, la rapidez de la descarga adquiere una mayor importancia, obligando la dispersión de los almacenes frigoríficos a realizar las descargas en los muelles comerciales con grúas eléctricas de pórtico. Se consiguen, de est forma, excelentes rendimentos—15 Tm. por grúa y hora y 0,7/0,8 Tm por hombre y hora— utilizando para la desestiba y descarga, personal especializado — adecuadamente protegido, y colocando el pescado en bandejas o jaulas paletizadas para su posterior manipulación en los frigoríficos. El transporte a distancias nunca superiores a 3 km se efectúa con la mayor rapidez posible, en camiones descubiertos, protegidos con toldos o encerados. Sería preferible la utilización de camiones refrigerados, aun para estas pequeñas distancias, pero la utilización de camiones cubiertos supondría una mayor dificultad de carga y descarga y un cierto encarecimiento de las operaciones. La preparación, clasificación e industrialización del pescado congelado, se realiza por las empresas privadas en sus instalaciones, sin intervención de la Autoridad portuaria.

La Junta del Puerto de Vigo tiene el proyecto de construir un muelle frigorífico adosado interiormente al dique de abrigo de Coya, con calado de 9,00 metros y explanadas adecuadas para la construcción de almacenes frigoríficos contíguos a la línea de atraque.

Los productos derivados de la pesca se descargan en los muelles comerciales como otras mercancías análogas, y por la Junta se prestan los servicios normales de almacenamiento.

Las ballenas y cachalotes llegan a puerto a remolque de los buques cazadores y son conducidos directamente a la factoria ballenera para su industrialización.

Pesca de altura—La pesca fresca de altura llega, prácticamente, a granel y sin clasificar en las bodegas de los buques, mezclado con hielo, y eviscerado. Una previa clasificación "a bordo" después de la pesca y el acondicionamuento en recipientes adecuados – cestos de plástico, sacos de papel, cajones, cajas de origen, etc.— como se efectúa en algunos puertos, facilitaría las operaciones en el terminal pesquero. Son ventajas que con éllo se lograrían; la reducción de la cantidad de hielo necesario por una mejor circulación de aire que favorece la refrigeración; suprimir la clasificación en puerto; la presentación del pescado para la venta en los cajones origina les, supriméndose todo tipo de manipulación entre el momento de la captura y la remesa al exportador o mayorista, y la disminución del tiempo entre descarga y ventas, en beneficio todo éllo de la calidad del pescado. Los factores negativos se presentan al estudiar la rentabilidad de las transformaciones necesarias en los barcos actuales, entre los que se incluiría el aumento del tamaño de las escotillas; en la normalización del tipo de recipientes utilizados y sistema de clasificación aceptables para los compradores y la Autoridad portuaria, en la formación del personal del barco para hacer estas operaciones, y la resolución de los problemas laborales que puede provocar la variación de métodos necesaria.

(a) **Descargas y lavados:** Es el momento a partir del que el pescado empieza a sufrir daños, las operaciones de descarga se realizan en el puerto de Vigo utilizando maquinillas de dos tambores situadas en tierra. El pescado mezclado con hielo se carga en bodega en cestos que se vuelcan en tinas con agua salada, situados sobre la cubierta del buque para el lavado y separación del hielo. Debe tenderse a que el agua salada de lavado, esté fría y esterilizada. Se coloca después en cajas de plástico para su descarga a tierra en los puestos de clasificación. Estas operaciones que se realizan con cierta rapidez exigen la intervención de un elevado número de obreros, con remuneración elevada, que encarecen la operación.

Si en países subdesarrollados el coste de la mano de ebra puede ser relativamente reducido,

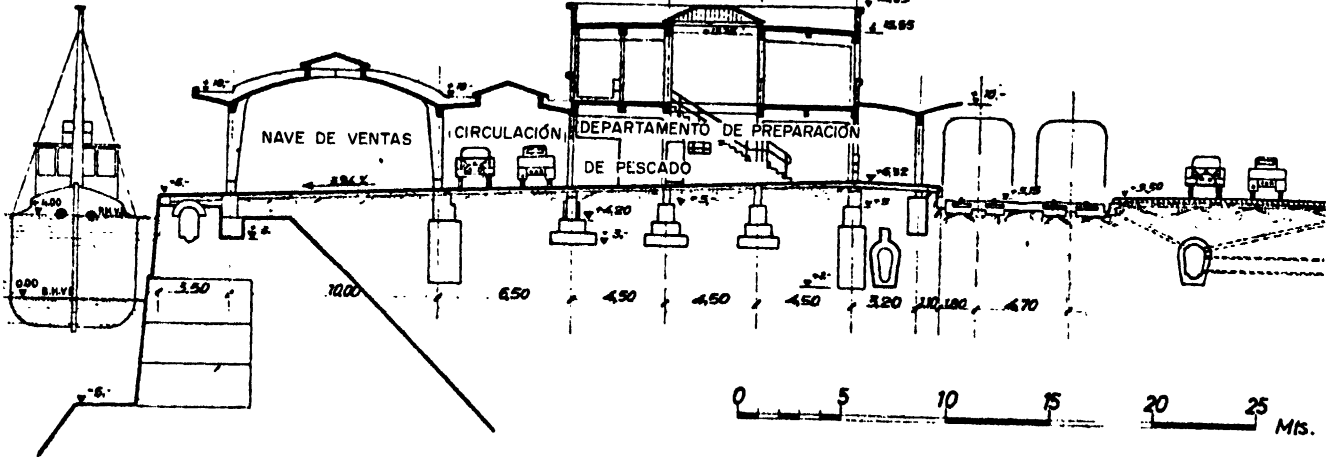

Fig. 5. Seccion del muelle y Lonja para pesca de altura.

en procesos de desarrollo es necesario mecanizar las operaciones, para reducir al mínimo la utilización del hombre como fuerza bruta, obteniendo condiciones de trabajo más benignas, y abaratando los costes de manipulación.

No parece fácil, en estos buques relativamente pequeños, la mecanización en el interior de las bodegas, por el escaso espacio que en éllas se dispone, y la variación de posiciones necesarias que durante la descarga precisaría sufrir el transportador utilizado. Una solución muy conveniente sería la utilización, en bodega, de cestos que una vez llenos son transportados horizontalmente en su interior por la acción del cable elevador, y su descarga directa en tierra en puntos de lavado automático, directamente conectado a cintas contínuas de clasificación. En este sentido se trabaja en estos momentos, proyectando un prototipo experimental para su posterior standarización.

(b) **Clasificación y venta subasta:** Desde el momento que el pescado llega a tierra, la manipulación se efectúa utilizando cajas de plástico de dimensiones y capacidad uniforme, que permiten la determinación inmediata de la cantidad de pescado, sin necesidad de pesarlo, con una suficiente aproximación. La elección de las cajas de plástico, suprimiendo las tradicionales cajas de madera, se ha basado en las evidentes ventajas que suponen mayor facilidad de limpieza y esterilización, menor peso, mayor duración y reducción de los gastos de conservación. Respecto a las de aluminio resultan menos ruidosas, pesadas y deformables.

La clasificación de este tipo de pescado variado, así como su peso, exposición y venta, se realiza generalmente en Lonjas, que deben estar situadas entre el muelle de descarga y los departamentos de los mayoristas o exportadores, reduciéndose al mínimo las distancias de transporte. Las funciones de las Lonjas de proteger al pescado y al personal durante las faenas de clasificación y venta, están ligadas a la conveniencia de lograr un eficaz aislamiento de los agentes exteriores, acondicionando el aire, si fuera posible, a temperaturas —del orden de 10° C— que sin hacer penosa la estancia para las personas, facilitan la conservación del pescado. El pavimento debe ser de fácil limpieza y no deslizante; el alumbrado con intensidad suficiente y sin posibilidad de dañar el pescado, y el agua de limpieza, salada y refrigerada, y esterilizada, además, para el lavado del pescado.

Los puestos de clasificación, situados, por tanto, en la nave de la Lonja, deben estar, inmediatos a los puntos en que se efectúa la descarga del buque.

La clasificación del pescado se hace actualmente en Vigo, manualmente, de caja a caja, procediéndose a continuación al pesado, en el caso de especies de mayor valor, y calculándose para las especies menos cotizadas el contenido de las cajas, a razón de 40 kgs. Ligado al estudio de la mecanización del sistema de descarga figura el propósito de completar la cadena con cintas transportadoras, que permitan la clasificación rápida y la entrega inmediata de las cajas con pescado clasificado a los punto de pesaje. Debe procurarse, dentro de las exigencias del mercado, simplificar la clasificación, reduciendo el número de tamaños y calidades dentro de cada especie de pescado.

Medida previa a la venta, es el control de calidad, que se debe efectuar en dos sentidos. Control imprescindible de la Autoridad Sanitaria, para rechazar el pescado no apto para el consumo humano, y control comercial que debe estar convenido entre armadores y compradores, y ejercerse por personal técnico, independiente de ambos o dependiente únicamente de la Autoridad portuaria.

La **subasta** se efectúa en la Lonja, en los lugares en que tiene lugar la exposición del pescado para su examen por los compradores. Los lugares de venta deben situarse junto a los de clasificación y pesaje, colocándose las cajas correspondientes a cada barco alineadas en la superficie concedida al buque para su exposición y venta. La paletización de cajas, de una misma especie, tamaño y calidad, supondría una sensible ventaja para el transporte posterior a los almacenes de los compradores.

La subasta se realiza en Vigo "a baja", simultáneamente para todos los buques, a partir de una hora determinada —las 7 o las 8 de la mañana, según las estaciones del año—, por los empleados de los armadores o de los consignatarios-vendedores que los represente, controlándose las cantidades y precios por los agentes de la Junta del Puerto, que pueden realizar directamente la venta en los casos en que se considere conveniente. Los armadores o sus agentes pueden detener la venta, cuando los precios desciendan por debajo de límites rentables, y quedarse con el pescado para su comercialización directa, o para una nueva subasta posterior.

Al parecer dicho sistema en teoría bastante anárquico, es el preferido por los armadores, que consideran que de esa forma todas las partidas de pescado están en igualdad de condiciones para alcanzar el mejor precio. En general las ventas se terminan en poco tiempo, y no se observan desórdenes en las operaciones.

Nuevas organizaciones pueden planificarse, de forma que se realicen las ventas del pescado de la misma especie sucesivamente, eligiéndose el orden de subasta o por orden de llegada del barco a puerto, y no comenzando cada venta hasta que no esté vendido el pescado correspondiente al barco anterior. Con este procedimiento tal vez no se alargase mucho la subasta, los compradores podrían actuar con menor esfuerzo y el control sería más sencillo, pero es muy difícil modificar un sistema tradicionalmente establecido, que los armadores y vendedores consideran bueno.

(c) **Transporte:** El transporte de los lugares de descarga a los de clasificación, o de los de ésta a los de exposición y venta, se realiza a mano arrastrando las cajas, o en carros empujados por empleados de los vendedores. Ya hemos indicado la conveniencia, que se trata de introducir en Vigo, de suprimir estos transportes mediante la introducción de una cadena contínua desde el buque al puesto de exposición y venta.

Los compradores, mayoristas o exportadores, retiran inmediatamente, después de la venta, el pescado que se les haadjudicado, y los medios de transporte utilizados dependen de la distancia a que se encuentren sus departamentos o almacenes.

Como estos almacenes suelen estar próximos a los lugares en que se realiza la subasta, el transporte se hace por medio de carros con ruedas neumáticas, arrastrados por los empleados de los compradores. Resulta conveniente el transporte con carretillas automotoras, transportadoras o elevadoras, con la ventaja que en este segundo caso puede conseguirse con la paletización de las cajas. Con objeto de que no tuviese que disponer cada comprador del material necesario, debería realizarse la distribución global por una entidad o asociación profesional de vendedores o compradores, o por la propia Autoridad portuaria.

(d) **Preparación, empaque y expedición:** Mientras los compradores para los mercados locales o muy próximos, se limitan a colocar el pescado en recipientes de su propiedad, con o sin la adición de hielo, por regla general, transportándolo personalmente, en vehículos propios hasta sus puntos de destino, en los que efectúa la venta inmediata al por menor, los suministradores de mercados lejanos, mayoristas o exportadores, precisan una preparación más cuidadosa.

Para los primeros dispone la Junta de una nave general de preparación, y para los exportadores, departamentos situados junto a la Lonja, con acceso directo desde ésta. Disponen de agua corriente, dulce y salada, energía eléctrica, piletas de lavado, depósitos de sal, oficinas, teléfono, servicios sanitarios y andenes para carga de vagones y camiones. Muchos de éllos disponen de bancos de clasificación y preparación, y de pequeñas cámaras frigoríficas para la conservación del pescado sobrante del día. En los casos en que las cantidades adquiridas les resulten excesivas, proceden frecuentemente a la congelación previa para su almacenamiento en frigoríficos. Distribuídos entre estos departamentos se sitúan varios puntos de entrega de hielo triturado o en escamas.

La preparación que realizan los exportadores, consiste principalmente en completar la limpieza y eviscerado del pescado en los casos en que sea necesario, la distribución o clasificación más cuidadosa, según las exigencias de sus clientes, y la colocación en cajas con hielo y sal. Se utilizan cajas nuevas de madera, de diferentes medidas, según las necesidades, no habiendo tanido, hasta ahora, aceptación la utilización de cajas metálicas o de plástico, por la dificultad del retorno y el perjuicio que su pérdida supone por el elevado coste. El fileteado no se ha introducido todavía en nuestros mercados, más que para pescados congelados, mientras que el corte en rodajas para la venta, se realiza frecuentemente por los detallistas, pero el incesante aumento del nivel de vida induce a creer que es inminente este tipo de preparación, con evidentes ventajas domésticas, aunque con un coste elevado por el gran procentaje en peso, no inferior al 60 por ciento, que debe ser vendido como subproductos.

Las expediciones se efectúan por ferrocarril o por carretera. En ambos casos la utilización de vagones o camiones aislados o refrigerados debe ser obligatoria a partir de una cierta distancia del puerto de origen. En Vigo se utilizan con frecuencia vehículos no aislados, que a pesar de que el transporte se efectúa, en su mayor parte, de noche, deben sustituirse por otros, al menos aislados, transformación que se facilita por la construcción reciente de gran número de unidades especiales para el transporte de pescados congelados.

Las expediciones desde Vigo cubren la mayor parte del área de la nación, con núcleos principales de venta en, Madrid, Zaragoza, Barcelona, Bilbao y Valladolid, y su zona de influencia para determinadas especies alcanzan las más apartadas regiones. En el pasado año 1967 el total exportado a mercados situados fuera de la provincia, fué de 32.500 Tm., lo que supone el 48 por ciento de la totalidad del pescado fresco desembarcado.

Pesca litoral: Los pequeños lotes de pescado, destinados al consumo local, que se descargan a mano por los pescadores, se venden a horas varias, y son retirados directamente por los compradores, realizándoses las transacciones, generalmente; con licitaciones simplificadas, en presencia de los representantes de la Junta, que perciben, en el momento de la transación, las tasas portuarias, y las deducciones correspondientes a Seguros Sociales y Montepíos de los pescadores.

Para el caso general de pesca de especies pelágicas, procedentes de bancos uniformes, las facetas que conviene destacar son las siguientes:

(a) **Subasta:** Teniendo en cuenta la corta duración del ciclo de pesca, los barcos pueden llegar a puerto, con el producto de sus caladas, a cualquier hora del día o de la noche, y resulta fundamental para los pescadores la venta inmediata del pescado para poder volver a salir a la mar, para repetir la suerte en los bancos de peces localizados. La uniformidad de la pesca capturada recomienda que se realice la venta teniendo únicamente a la vista una muestra del pescado, bajo la responsabilidad del armador de que representa relamente en tamaño y calidad el total de la pesca que se ofrece.

La subasta se realiza a cualquier hora del día o de la noche, en forma contínua, avisándose la llegada de un barco por la Lonja, con toques de sirena. El edificio de esta Lonja de pesca litoral, está situado en la zona más céntrica del puerto pesquero. También en estas subastas puede el vendedor detener la subasta y quedarse con su propia pesca, cuando el precio descienda a cifras no rentables.

La importancia del conocimiento de las ofertas y precios de otros mercados pesqueros y la conexión con las empresas conserveras o reductoras, queda garantizada con una amplia red telefónica y la existencia de cabinas reservadas para los compardores importantes.

Los pescadores, tripulantes de los barcos dedicados a la pesca litoral, trabajan "a la parte", es decir, que descontados determinados gastos, que, según la terminología local, corresponden al "monte mayor", y de remuneración personal en especie de los pescadores, en los casos que proceda, el producto de la venta se reparte en porcentajes tradicionalmente convenidos entre el armador y los pescadores, con una media del 66 por ciento para el armador y un 34 por ciento para los pescadores, que después reparten, según partes tambien tradicionalmente establecidas entre éllos, abonando el armador, de su parte, entre otros gastos, las remuneraciones del patrón y de los especialistas, combustible, reparación de artes, etc.

(b) **Descargas:** Se realizan personalmente por los pescadores que, por tener intereses directos, tratan de evitar gastos que disminuirían el importe de su participación. Por tradición, las descargas pueden realizarse, a voluntad del comprador, tanto por los muelles del puerto de Vigo, como en cualquier muelle o rampa de la Ría, ya sea pública o particular, de una fábrica de conservas o de otra cualquier actividad.

De todas formas, la descarga en cestas —sardinas, jurel— o por unidades —albacora, atún, palometa— según las especies, se hace por pescadores, formando cadena entre el buque y el vehículo de transporte, en forma relativamente costosa en horas de trabajo.

Tanto en estos casos como en la descarga masiva de otras especies como los cefalópodos — choco, pulpo, calamar y los pescados de menor calidad, destinados a subproductos, aparece claramente la necesidad de mecanizar las operaciones de descarga, aumentando su rendimiento y disminuyendo su coste. En estos casos de pescado uniforme "a granel", es recomendable la utilización de instalaciones de descarga, por medio de tubería y bomba de aspiración, de una mezcla de pescado, hielo y aire, añadiendo agua al pescado para facilitar la operación. De la perfección de la maquinaria utilizada depende su mayor o menor aplicación a determinadas especies, ya que debe exigirse que el pescado descargado por este procedimiento no se lesione ni sufra depreciación en su aspecto o calidad. Se han iniciado en Vigo las gestiones para la adquisición y montaje de una instalación de esta naturaleza, con rendimiento mínimo de 40 Tm/hora, destinada, en principio, a la descarga de cefalópodos —choco y pulpo— y moluscos — almeja, berberecho— y de pescados de especies inferiores —jurel, bocarte— o destinados a las

CUADRO 1. DISTRIBUCIÓN DE LA PESCA FRESCA POR MESES

MESES	CALADAS DESCARGADAS	MOLUSCOS		CRUSTACEOS		PECES		TOTALES	
		KILOS	PESETAS	KILOS	PESETAS	KILOS	PESETAS	KILOS	PESETAS
Enero	569	984.480	7.096.360	7.500	178.685	2.052.837	40.375.697	3.044.817	47.650.742
Febrero	697	1.397.870	10.303.540	5.339	441.820	2.244.167	48.030.476	3.962.247	58.775.836
Marzo	769	726.380	7.796.335	5.613	407.898	3.153.928	66.954.821	3.885.921	75.159.054
Abril	685	1.325.020	10.733.270	10.340	608.965	2.594.755	54.787.469	3.930.115	66.129.704
Mayo	617	1.012.960	7.586.340	14.585	1.393.170	3.339.852	52.964.296	4.367.397	61.943.806
Junio	968	890.480	6.024,760	49.743	3.526.225	5.623.836	90.296.748	6.564.059	99.847.733
Julio	1.570	789.560	5.709.275	75.223	6.175.440	10.136.267	229.803.296	11.001.050	241.788.011
Agosto	1.364	819.000	5.515.290	54.984	5.498.400	6.664.949	104.120.749	7.538.933	115.134.439
Septiembre ..	1.151	1.213.800	10.235.185	15.695	1.569.500	4.349.452	61.634.442	5.578.947	73.439.127
Octubre	1.160	1.280.960	11.328.910	7.805	780.500	3.680.663	52.202.267	4.969.428	64.311.577
Noviembre ...	1.012	2.832.076	25.171.774	1.579	157.900	4.540.058	61.595.305	7.373.713	86.924.979
Diciembre	815	2.668.343	18.987.115	8.173	1.385.100	3.533.615	76.591.695	6.210.131	96.963.910
Totales ...	11.377	15.940.929	126.488.154	256.579	22.223.603	51.914.379	939.357.261	68.111.887	1.088.069.018

industrias reductoras, con la posibilidad de que se estudie el resultado obtenido y se pueda aplicar a la descarga de otras especies más delicadas. **Transporte:** Cuando el pescado es adquirido para el consumo directo en fresco, el transporte y preparación del mismo por los compradores de mercado locales o por los exportadores mayoristas, es análogo al indicado para el pescado fresco de altura.

Resúmen estadístico

La importancia relativa de los distintos tipos de pesca se deduce del resumen siguiente:

	Kilogramos	*Por ciento*
Pesca fresca Vigo	68.111.887	44,7
id. Cangas	1.117.129	0,7
Pesca congelada	66.715.536	43,8
Bacalao verde	11.224.222	7,4
Ballenas y cachalotes	2.411.300	1,6
Mejillones de vivero	2.816.000	1,8
TOTAL	152.396.074	

La variación en los últimos diez años de las descargas de los distintos tipos de pesca, puede fácilmente apreciarse en el gráfico.

Junta del Puerto y Ría de Vigo

La Junta del Puerto es una Entidad Estatal Autónoma que tiene encomendada, en régimen de descentralización la organización, gestión y administración del Puerto de Vigo, y de los restantes puertos, embarcaderos y zonas marítimo-terrestres de la ría. Tiene personalidad jurídica y patrimonio propio, independiente de los del Estado.

Constituye, por lo tanto, la Autoridad Portuaria, y tiene a su cargo la planificación, proyecto, ejecución y conservación de las obras e instalaciones, y la ordenación de la zona portuaria y sus futuras ampliaciones. Le corresponde, además, la dirección, organización y gestión de los servicios afectos al puerto, su régimen de policía, el establecimiento de los servicios especiales y complementarios, y la superior coordinación para conseguir la rentabilidad y productividad de la explotación del puerto.

La dependencia de la Administración Central, a través del Ministerio de Obras Públicas, limita su autonomía en el sentido de reservarse el Gobierno la aprobación de los planes generales de obras, la supervisión técnica de los proyectos y la intervención delegada de los gastos, debiendo sus presupuestos anuales, elevarse al Ministerio de Hacienda para su aprobación. Al Gobierno corresponde, tambien, la política general de coordinación de transportes y de tarifas portuarias.

La Junta del Puerto de Vigo se constituyó en el año 1881, y su composición y facultades sufrieron diversas variaciones, que recientemente se han consolidado con la Ley No. 27/68 sobre "Juntas de Puertos y Estatuto de Autonomía". La composición de las Juntas queda establecida en la siguiente forma:

(a) **Vocales Natos (representantes de la Administración central o local):** El Presidente, nombrado por Decreto, el Comandante de Marina, el Administrador de la Aduana, el Abogado del Estado, el Alcalde de la Ciudad, el Presidente de la Diputación, el Director y el Secretario.

(b) **Vocales electivos (representantes de los usuarios):** Cuatro designados por la Organización Sindical en sectores económicos, dos por las Cámaras Oficiales o Entidades profesionales y dos por el personal trabajador del Puerto.

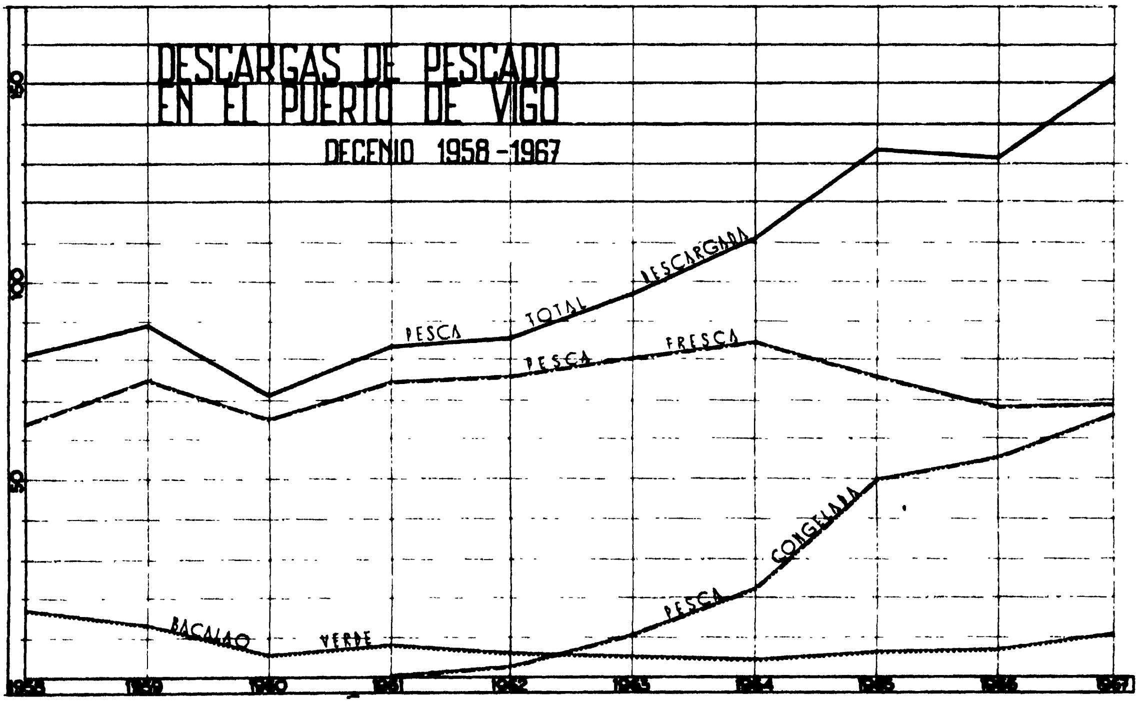

Fig. 6.

El Comité Ejecutivo esta constituído por diez miembros: Presidente, Comandante de Marina, Administrador de la Aduana, Alcalde, Director, Secretario y cuatro vocales electivos, de entre los cuales se elige el Vicepresidente.

En el puerto de Vigo, con actividades pesqueras muy destacadas tradicionalmente han formado parte de la Junta y del Comité ejecutivo dos vocales representantes directos de los sectores pesqueros, estando la mayor parte de los vocales electivos, e incluso los vocales natos no funcionarios públicos (Presidente, Alcalde, Presidente de la Diputación), interesados en una u otra forma en los negocios de la pesca.

El Ministerio de Obras Públicas, a propuesta de la Junta, otorga concesiones administrativas para la ocupación de superficies destinadas a la construcción de obras a instalaciones relacionadas con el tráfico portuario, y a su vez, la Junta autoriza directamente las ocupaciones provisionales por plazo limitado. La prestación de servicios públicos en la zona portuaria puede, igualmente, ser objeto de concesión a particulares, bajo la inspección de la Junta que garantice el cumplimiento de las condiciones de la autorización, y proteja los intereses generales del puerto y de sus usuarios.

El Puerto Pesquero es uno de los sectores a cargo de la Junta del Puerto. Dispone ésta de una organización general de conservación y explotación de las obras y servicios a su cargo, con lo que se obtiene una evidente economía y rendimiento. Una sección especialmente encargada del Puerto Pesquero, tiene a su frente un Contramaestre de Explotación a las órdenes del Comisario del Puerto, y éste, a su vez, a las del Ingeniero de Explotación.

En las oficinas generales de la Junta en el Puerto Pesquero, se atiende simultáneamente a cuantos servicios solicitan los armadores o los consignatarios-vendedores que les representen, y que directamente se prestan por la Junta, pero existen servicios de la Administración a cargo de otros Organismos. El Reglamento de las Instalaciones y Servicios Pesqueros en el Puerto de Vigo, regula las relaciones de la Junta con los armadores, consignatarios-vendedores y compradores de pescado, y la utilización y funcionamiento de las obras e instalaciones del Puerto Pesquero y de sus Lonjas o Mercado Terminal.

Comandancia de Marina—Corresponde a este Servicio el despacho del buque y la inspección de sus condiciones de seguridad, así como el control de entradas y salidas de los buques en puerto, y de las altas y bajas de las embarcaciones inscriptas en el puerto y que se dedican a la pesca.

Dependiendo del Ministerio de Comercio (Dirección General de Pesca Marítima) controla las dimensiones de las mallas y el tipo de las artes y aparejos utilizados para la pesca, las especies pescadas y los lugares de pesca, con la finalidad prinicpal de que se respeten las redes reglamentarias por especies y áreas de pesca, y el tamaño de las capturas que se efectúen. Realizan este control, tanto en tierra durante las descargas y ventas, por medio de celadores, como en el mar por medio de buques guardapescas y de vigilancia, persiguiéndose intensamente el uso de explosivos y otros medios nocivos para la pesca.

Sección de Trabajos Portuarios—Depende del Ministerio de Trabajo a través de la Delegación Provincial, y tiene como misión genérica la de "conocer y resolver los asuntos y problemas referentes a ordenación laboral, relaciones de trabajo y asistencia social de los trabajadores portuarios, velando por su perfeccionamiento, por la elevación de su nivel moral, profesional y económico, y la mejora de la productividad". Los trabajadores portuarios son los dedicados a la carga y descarga de mercancías en el puerto, y en tre éllos figura un grupo o "colla" pesquera. Teniendo en cuenta la eventualidad de este trabajo, existen dos listas, una de plantilla y otra de eventuales censados, y en casos de gran demanda de trabajadores, y de que todos los de las listas anteriores estén ocupados, puede utilizarse personal ajeno designado como "peones de plaza".

Los armadores solicitan el número de obreros que precisan, que se designan por lista en turno rotativo hasta cubrir las listas de plantilla y de eventuales censados.

Instituto Social de la Marina—Entidad Estatal Autónoma dependiente del Ministerio de Trabajo, que tiene como función la protección social del obrero del mar, en todos los casos, y la protección e impulso de las industrias marítimas, facilitando créditos a los pescadores para la adquisición, construcción y reparación de embarcaciones. Para estas atenciones sociales perciben los porcentajes establecidos sobre los importes de las ventas en la pesca litoral "a la parte", o sobre los salarios de los marineros en los restantes tipos de pesca.

Inspecciones Sanitarias—La inspección sanitaria del pescado se realiza por el Servicio Veterinario Municipal, que inspecciona el pescado antes de la subasta, y determina el pescado que no es apto para la venta, y el que solo puede venderse como subproducto para fábricas de harinas, grasas o aceites.

Escuela de Formación Profesional Náutico-Pesquera "Almirante Nieto Antúnez"—Depende del Ministerio de Comercio (Subsecretaría de la Marina Mercante) Instrucción Marítima) y está construída sobre un solar de 5.250 m/2., cedido por la Junta del Puerto. Está funcionando desde el año 1965.

Su principal cometido es atender a la instrucción del personal que ha de dotar a los buques pesqueros, comprendiendo la formación de Capitanes de pesca, Patrones, Mecánicos navales, Motoristas, Radiotelegrafistas, en sus diferentes categorías y clases, y todas las especialidades establecidas o que puedan establecerse en los buques pesqueros, tales como, Electricistas navales, Marineros mecánicos, Frigoristas, Técnicos en conservas para buquesfactoría, etc. y Marineros especialistas en las distintas actividades necesarias para los buques pesqueros de cualquier clase y tonelaje.

Entidades dedicadas a la investigación—Destaca entre estas entidades el **Instituto de Investigaciones Pesqueras**, que, con carácter nacional, se dedica a la investigación en campos muy diversos relacionados con la pesca.

El **Instituto Español de Oceanografía** tiene a su cargo funciones investigadoras de carácter más general, relativas a "las condiciones físicas, químicas, dinámicas y biológicas de las aguas del mar, y a la mayor explotación de sus riquezas".

Pesca—Todos los intereses que afectan a las empresas y trabajadores relacionados con la pesca, se desarrollan a través del Sindicato Nacional de la Pesca. En este Sindicato, las distintas actividades están divididas en tres ciclos—producción, industria y comercio—divididos por actividades en grupos y subgrupos, en los que actúan independientemente pero en contacto permanente, las secciones económicas que representan a las empresas y las secciones Sociales que agrupan a los trabajadores. Solamente los trabajadores de la Junta del Puerto y de la Sección de Trabajos Portuarios están encuadrados en Sindicatos diferentes al de la Pesca.

Ciclo de producción

Comprende este ciclo los siguientes grupos:

1—Caza de cetáceos
2—Pesca del Bacalao
3—Buques congeladores
4—Pesca de altura
5—Pesca litoral o "de bajura", y
6—Parques, viveros y cetáreas de crustáceos y moluscos

Las empresas que componen cada uno de estos grupos son, para los cinco primeros, los armadores de los buques y para el sexto, los propietarios de los parques, viveros y cetáreas. Las Secciones Sociales incluyen además de las tripulaciones de los buques —marineros y especialistas— el personal de tierra, entre el que figuran los "chavoleros" —encargados de los almacenes de pertrechos—, los "paneros" —dedicados a la limpieza de bodegas y tablas de separación del pescado en las bodegas— y los serenos o vigilantes, que custodian el barco en puerto cuando se ausentan los tripulantes.

Armadores—Los armadores de esta Región han tenido tradicionalmente actuaciones individuales o familiares, que comenzaron, en muchos casos, con un solo barco y ampliaron sus actividades a medida que el incremento de sus negocios les fueron permitiendo aumentar el número de embarcaciones de su propiedad.

La complejidad, siempre creciente, de los negocios pesqueros, la necesidad de mayores inversiones para adaptarse a las nuevas técnicas, e incluso la distribución familiar de las empresas individuales al desaparecer los fundadores, van venciendo la recelosa individualidad e independencia característica de los gallegos, como de otros pueblos celtas, llegándose a la constitución de verdaderas empresas o sociedades pesqueras, sociedades administradoras de buques en sistema cooperativo, e incluso verdaderas cooperativas de armadores, que además se constituyen para la construcción de barcos nuevos de propiedad comunitaria.

Resulta especialmente interesante la formación de cooperativas de armadores de pesca litoral, que al amparo de créditos oficiales, han desguazado sus viejos barcos de madera, anticuados y antieconómicos, y han construído nuevas y modernas unidades pesqueras, con completo éxito y apreciable satisfacción de los asociados.

Otro ejemplo lo constituye la Cooperativa de Armadores de Buques de Pesca Congeladores de Gran Altura —COPEGEL—que ha logrado importantes éxitos en beneficio de sus asociados, estableciendo servicios comunes de pólizas conjuntas de seguros marítimos; suministros de combustible y pertrechos; oficinas de representación y despacho en los puertos extranjeros próximos a sus caladeros habituales, y otras atenciones semejantes. El considerable aumento de la oferta del pescado congelado, que se ha producido en los últimos años, ha creado problemas de comercialización, que se abordan tambien por esta Cooperativa, que tiene entre sus objetivos el planeamiento de los stocks de pescado y puntos de almacenamiento; la designación de los puertos de descarga y de los frigoríficos de almacenamiento más convenientes, de los servicios de descarga y transporte a frigorífico; de los frigoríficos para almacenamiento y de la venta del pescado a empresas distribuidoras, tanto nacionales como extranjeras, en las condiciones más favorables.

Por el Gobierno Español se ha protegido la construcción naval pesquera, dictándose en 1939 la Ley General de Crédito Naval, y en 1961 la Ley en Renovación y Protección de la Flota Pesquera, que por medio de créditos oficiales, a medio y largo plazo, exenciones tributarias y otras facilidades, han alcanzado metas importantes en la renovación de la flota pesquera y en la introducción de nuevas técnicas y sistemas en la construcción naval. También se conceden importantes facilidades para la concentración de empresas y la constitución de cooperativas.

Disposiciones oficiales de los Ministerios de Hacienda y de Comercio, permiten el transbordo de la pesca desde los barcos españoles que la capturaron a otros barcos de transporte nacionales o extranjeros, sin perder por eso la condición de pesca española, exenta de derechos al realizarse la descarga en puerto. Estas facilidades incluyen la posibilidad de depósito en puertos extranjeros, con el simple requisito de la certificación del cónsul español local antes de su remisión, por cualquier medio, a puertos españoles.

Cofradías de Pescadores—Las atenciones sociales, primarias y obligatorias de los pescadores, están garantizadas por el Instituto Social de la Marina, y las de instrucción y capacitación, por la Escuela de Formación Profesional Náutico-Pesquera, pero existen unas entidades de gran tradición, herederas de las asociaciones gremiales medievales que son las Cofradías de Pescadores, que eran las únicas que ofrecían servicios asistenciales y de hermandad, hasta que se implantaron los Seguros Sociales obligatorios, con carácter general.

La tradición de las Cofradías, y la adhesión y confianza que siempre les han demostrado los pescadores, mantienen la existencia de estas asociaciones, que agrupan a pescadores y armadores, y que tienen entre sus fines, la resolución de conflictos entre empresarios y trabajadores, especialmente en las modalidades de pesca "a la parte"; prestaciones asistenciales complementarias para los pescadores; ayuda a las actividades pesqueras con préstamos a los pescadores o armadores medestos; divulgación de las facilidades para préstamos oficiales, para la formación de cooperativas y sobre los derechos sociales de los trabajadores; propuestas para intensificar la producción pesquera en cantidad y calidad, e intervención, si fuese necesario, en beneficio de sus asociados, en la venta, industrialización o comercialización del pescado.

Existen además organizaciones privadas asistenciales para huérfanos de pescadores, guarderías infantiles y hogares-residencia para pescadores viejos.

Ciclo de industria

Los grupos de este ciclo son:

1—Conservas de pescado
2—Salazones, ahumado y secado
3—Factorías de secado de bacalao
4—Fábricas reductoras de pescado
5—Fábricas de grasas, abonos y aceites de pescado
6—Frío industrial para la pesca.

Industrias derivadas de la pesca—Para el desarrollo de un puerto pesquero es fundamental la existencia de industrias que utilicen como materia prima los productos de la pesca. Junto a las fábricas de conservas y semi-conservas, y las dedicadas a la preparación de salazones y pescados ahumados y secos, que utilizan las especies con mayor demanda posterior, (sardinas, túnidos, moluscos, caballa, anchoa, bacalao), las industrias reductoras, productoras de harinas, aceites y grasas, absorben las especies menos solicitadas, las partidas de pescado de calidad inferior, los subproductos y los excedentes de producción que excepcionalmente pudieran producirse.

La tradición salazonera y conservera de Galicia es muy antígua, estando concentrada en la región más del 60 por ciento del total de la industria nacional de conservas de pescado, con una capacidad de producicón de 190.000 Tm. anuales. Más de 200 fábricas son el resultado del espíritu emprendedor gallego, pero la concentración de esfuerzos en busca de una mayor productividad y rendimiento, hace necesario superar el individualismo, habiéndose creado en los últimos años o activado el funcionamiento de asociaciones, y empresas destinadas a prestar servicios comunes a las industrias. En el I Plan de Desarrollo Económico y Social se estimaba que la producción mínima por planta debía ser de 450 Tm; superior a la capacidad teórica de producción de más de un 60 por ciento de las fábricas existentes, por lo que se promociona la concentración de empresas con medidas oficiales de protección, por medio de facilidades creditícias y de bonficaciones fiscales.

La Unión de Fabricantes de Conservas de Galicia, constituída en régimen de cooperativa, dispone de una organización general para adquisiciones de materias primas; de laboratorios y escuela de capataces conserveros; fomenta la normalización de envases; informa sobre precios y mercados, y ha creado una Central de Ventas para el exterior, para fomentar las exportaciones.

Una empresa reductora —Auxiliar Conservera, S. A. AUCOSA— formada por conserveros, utiliza los subproductos de las fábricas de conservas para producción de harinas en régimen cooperativo. Esta empresa proporciona recipientes metálicos a todos sus proveedores, que recogen camiones-gruá con transporte aislado y rápido. La empresa fija unos precios para los despojos suministrados por los asociados al comenzar cada ejercicio económico, realizándose, al final del mismo, el balance y determinación de beneficios que se aplican al tonelaje total entregado, con abono de un precio complementario de las entregas realizadas, con independencia de los beneficios producidos por otros servicios o fabricaciones con productos de otras procedencias que se aplican al capital según la participación de cada accionista. Esta cooperativa ha ampliado sus actividades al frío industrial, construyendo un complejo frigorífico, con instalaciones de congelación y almacenamiento.

Otra empresa de análoga naturaleza—CARNAUD GALICIA, S.A.—centraliza la producción de envases, sustituyendo a las anteriores fabricaciones que cada conservero realizaba individualmente, con medios de importancia variable y características frecuentemente artesanas, e introduciendo la necesaria normalización de formatos. La maquinaria que cada fábrica de conserva tenía, fué aportada a la nueva sociedad.

Frío industrial para la pesca—Tanto para la regularización de las existencias de productos congelados destinados al consumo humano, como para el abastecimiento gradual de las industrias conserveras, el puerto pesquero precisa disponer de instalaciones de congelación de gran capacidad y volúmenes de almacenamiento frigoríficos, acordes con la cantidad de pescado descargado.

En el Puerto Pesquero de Vigo se han fomentado estas instalaciones, disponiéndose en la actualidad de 21 túne les y armarios, de varios tipos, para la congelación de pescado fresco, con una capacidad de 838 Tm. en horas, y de 135.000 m/3. de cámaras frigoríficas, con temperaturas de −18° a −30° C. La casi totalidad de estas instalaciones están construídas en la zona industrial pesquera del puerto, en terrenos facilitados por la Junta, y son de propiedad particular, prestando servicios públicos, con tarifas controladas por la Administración portuaria.

Otras industrias relacionadas con la pesca—En el Puerto Pesquero tienen cabida otras muchas industrias relacionadas con la pesca, especialmente los astilleros destinados a la construcción de buques pesqueros, disponiéndose además en Vigo, de fábricas de estachas y malletas de cáñamo o abaca con alma de acero, cables y redes de nylon y otros productos plásticos; litografías para cajas de conservas; cajas de cartón y madera, para pescado congelado y para conservas y fabricación de platos de cocina congelados, que utilizan el pescado y el marisco como base de las comidas típicas regionales.

Ciclo del comercio

En este sector, íntimamente relacionado con el mercado terminal pesquero, figuran los siguientes grupos:

1—Vendedores y mayoristas de pescado
2—Exportadores de pescado
3—Detallistas
4—Comercio exterior.

Vendedores y mayoristas de pescado—La venta del pescado puede realizarse por el armador del buque siempre que liquide y haga efectivos en el acto las tasas portuarias y los restantes gastos que se produzcan. La Junta del Puerto expide licencias a los armadores que lo solicitan para vender directamente su propio pescado, siempre que se ofrezcan garantías mancomunadas por un grupo de, al menos, tres armadores, haciéndose solidarios en conjunto de los débitos que cada uno de los armadores del grupo pudieran contraer.

En los restantes casos, la venta del pescado se hace con la intervención de un consignatario-vendedor, cuyo título es extendido discrecionalmente por la Junta del Puerto a todos los españoles mayores de edad, matriculados en Hacienda, que formen parte del grupo profesional sindical correspondiente, y depositen, en metálico, valores del Estado o aval bancario, la finza que se considere conveniente, según la importancia de las operaciones que realice.

La función de los consignatarios-vendedores es compleja, pues son, en realidad, los representantes de los armadores ante la Junta del Puerto y restantes Organismos relacionados con la pesca. Se hacen cargo del barco cuando llega a puerto, y realizan todos los trámites de despacho del buque, de petición de servicios y suministros, efectúan la descarga del pescado, su clasificación, su pesado y venta. Se encarga del pago de todo tipo de tasas, impuestos y servicios, y es responsable solidario con el armador de estos débitos. Por otra parte, abona al armador el importe líquido de la venta de la pesca, y concede, a su vez, a los compradores, el aplazamiento de los pagos que considere conveniente.

Los vendedores contratan del Servicio de Trabajos Portuarios el personal eventual de la "colla pesquera" necesario para la descarga, y del Grupo Social Especial que comprende para trabajos en tierra, arrastradores, clasificadores, escabicheros o transportistas, pesadores y estibadores.

El vendedor es persona de absoluta confianza del armador, pues actúa como administrador legal de sus bienes, y le asesora en cuestiones financieras, e incluso le proporciona créditos, sin interés, para pertrechar y preparar el barco y salir a la mar, a cuenta de los productos de la pesca que realice. Esta confianza es la garantía de la función pues el armador cambiaría de vendedor al menor motivo de desconfianza o incompetencia, resultando su honradez y oficacia la mejor razón de la permanencia de este sistema. El vendedor cobra por la prestación de todos sus servicios una comisión del 2 al 3,5 por ciento del importe de la subasta, lo que garantiza al armador la defensa del precio de su pescado al ser partícipe el vendedor del producto obtenido.

Se ha tratado de la eliminación de los vendedores, sustituyéndolos por un organismo único vendedor, de carácter asociativo o profesional sin afán de lucro, que disminuiría los costes por la concentración de los servicios, y que destinaría los posibles excedentes o beneficios a devoluciones a los propios armadores en proporción a las ventas realizadas, o a tenciones asistenciales y de ayuda a armadores y pescadores. Con estas finalidades, y siguiendo directrices gubernamentales, se procedió por la Junta del Puerto a concursar, por separado, la explotación de la Lonja de pesca litoral o de bajura, y de la Lonja de altura.

La explotación de la Lonja de pesca litoral o de bajura, fué adjudicada hace cuatro años a la Cofradía de Pescadores "San Francisco" de Vigo, que se comprometió a establecer una agencia de ventas, en competencia con los vendedores existentes. El establecimiento de este servicio fué un completo fracaso, a pesar de que reducía los costes, disminuyendo la comisión en un 50 por ciento por desconfianza de los armadores, con lo que su gestión queda limitada al cobro de los derechos reconocidos de explotación, que destina a fines asistenciales. Ante este resultado quedó temporalmento suspendido el concurso de explotación de la Lonja de Altura.

Compradores—Para ser comprador de pescado es suficiente solicitarlo de la Dirección de la Junta del Puerto, demostrando estar debidamente matriculado como detallista, exportador, o fabricante de conservas, salazones o subproductos. Se lleva un libro registro de compradores, y se exige una fianza reglamentaria que no se hace, de momento, efectiva, por ser los armadores y vendedores los que garantizan el pago de las tarifas y servicios portuarios.

Las operaciones de compra de la pesca litoral o de bajura que, en pequeños lotes, se vende directamente a detallistas, se liquida en el momento de la venta, abonándose simultáneamente las tarifas portuarias y los Seguros Sociales al agente de la Cofradía. Las compras por muestra realizadas en el salón de contratación de la Lonja de pesca litoral, se liquidan por la Cofradía concesionaria, que controla cantidades y precios y recauda las indicadas tarifas y seguros.

En el caso de la pesca de altura, los vendedores realizan todas las operaciones de palabra, sin documento alguno que ligue a las partes. La simultaneidad de las ventas de varios barcos obligan a los compradores a señalar con su tarjeta la opción a determinados lotes al precio resultante de la subasta, que no tiene efecto si un comprador se le adelanta y compra la totalidad. Si el precio del remate no resulta aceptable, puede retirarse la tarjeta de reserva, de forma que ésta no obliga pero dá opción a una compra que se suele respetar.

Los exportadores compran el pescado en dos formas distintas: en firme para clientes determinados, que les formulan sus pedidos con limitación de precios, de acuerdo con la demanda de su localidad; y a comisión negociando por cuenta propia y remitiendo el pescado a corresponsales o agentes, generalmente asentadores en los mercados centrales de las grandes ciudades, y corriendo el riesgo de las posibles fluctuaciones de los precios según las ofertas diarias de distintas procedencias.

Redes de comercialización y distribución—El establecimiento de las redes de comercialización y distribución de los productos de la pesca, desde que se efectúa la primera venta en la Lonja, hasta que llega al consumidor, constituyen el último eslabón del ciclo pesquero, del que no puede independizarse, ya que el fracaso en la redes de distribución conduciría forzosamente a una contracción de la demanda, con la consiguiente disminución en los precios y la frustración, en definitiva, de cuantos esfuerzos se hayan realizado en aumentar la producción y mejorar los rendimientos.

El estudio del aumento de la producción debe realizarse simultáneamente, con una prospección de los mercados posibles, siguiendo métodos de "marketing", cuyos resultados nos indicarán con bastante claridad las posibilidades reales presentes y futuras del mercado, en relación de los productos que puedan ofrecerse, y su forma de preparación y presentación.

El establecimiento de una organización central que, con bases técnicas de exploración de mercados, puede orientar sobre los problemas de la demanda y los sistema más adecuados de publicidad resulta muy conveniente para que los sectores de la producción puedan dirigir sus actividades, con garantías razonables de éxito.

El estudio de las redes de distribución comprende, sintetizando de una manera simplista, transportes, almacenamientos y ventas al detallista. Es fundamental, no solo que el pescado llegue a todos los rincones del país, sino que llegue en buenas condiciones para el consumo. Sería deseable que el pescado llegase directamente del puerto de descarga al detallista y de éste, de forma inmediata, al consumidor, pero este objetivo no es fácil alcanzarlo en las grandes ciudades.

La red de distribución puede ser un eslabón encarecedor en la cadena comercial del pescado, con exagerados beneficios para los intermediarios, cuyo número se multiplica en algunas ocasiones, y cuyos márgenes de beneficios pueden ser desproporcionados a sugestión.

La organización que, desde hace muchos años, se ha ido perfeccionando en el puerto de Vigo, supone la existencia de una red de distribución directa de exportación, entre 140 exportadores y 6.000 a 8.000 clientes detallistas, a los que se remite diariamente desde una caja de 20 Kgs. a 10 cajas de 40 Kgs., utilizando en proporciones semejantes la carretera y ferrocarril en gran velocidad, con menores precios del transporte ferroviario en contraposición a una mayor elasticidad y rapidez del transporte con camiones. Igualmente se realizan las remesas, siempre en cantidades más importantes a mayoristas y asentadores de los mercados centrales de las grandes ciudades, que disponen de cámaras frigoríficas propias o utilizan los almacenes públicos del mercado.

En la comercialización del pescado fresco, debe considerarse la conveniencia de distribuir el pescado cortado o fileteado, evitándose los cuantiosos gastos que suponen el transporte, almacenamiento y distribución de cabezas, aletas, espinas y vísceras, porciones generalmente no aprovechables para el consumidor, y que se convierten en basuras, cuando una separación en origen hubiera permitido su provechosa utilización por las industrias reductoras.

La rápida necesidad de introducir en los mercados el pescado congelado, como consecuencia del desarrollo de la producción, que ha pasado en España, de cero en 1961 a unas 140.000 Tm. en 1967 —de las que 66.700 se descargaron en el puerto de Vigo—, ha exigido la creación de nuevos canales de distribución, ya que el sistema establecido para el pescado fresco no ha tenido la elasticidad suficiente para adaptarse a la situación creada por las descargas de tan importante contingente de pescado congelado.

La demanda de pescado congelado en la Lonja del Puerto Pesquero de Vigo fué, desde el primer momento, muy reducida, como consecuencia de una preparación insuficiente de los mercados y del recelo de los exportadores. La gran capacidad de almacenamiento frigorífico, constantemente ampliada en los años transcurridos, permitieron la regulación de los stocks y la creación de cadenas de distribución en muchos casos creadas por las mismas empresas armadoras, que con gran potencia económica o en régimen cooperativo de concentración, han llegado incluso a la creación de puestos reguladores para la venta, desarrollando en estos casos, sin intermediarios, el ciclo completo producción-comercio del pescado congelado.

Ha sido necesaria la creación de una importante flota de camiones frigoríficos, la construcción de almacenes frigoríficos en los grandes centros de consumo, y la financiación de una extensa red de cámaras y vitrinas frigoríficas en los puestos de los detallistas, no solo en las ciudades sino también en los pequeños pueblos y núcleos de consumo. Es una ardua labor, todavía no finalizada, pero indispensable para alcanzar una normal comercialización de la pesca de esta forma considerada.

La construcción en otros puertos españoles de frigoríficos, ha permitido desconcentrar las descargas que, en un principio, se concentraron en el puerto de Vigo, disminuyendo gastos de transporte terrestre hasta algunos centros de consumo.

La riqueza nutritiva de los productos del mar, que constituyen la reserva alimenticia capaz de elevar, en muchos pueblos desnutridos, el nivel proteínico de su dieta, a precios relativamente bajos, en comparación con los de otros alimentos de análoga naturaleza, induce a programar la exportación de posibles excedentes de la producción pesquera, de forma que al mismo tiempo que se presta un estimable servicio, se favorece la balanza de pagos del país, y el intercambio comercial entre las naciones. Resulta necesario la creación de centrales de venta para el exterior en los distintos sectores pesqueros — como las creadas por la Unión de Fabricantes Conserveros de Galicia, y por la Cooperativa de Armadores de Buques de Pesca Congeladores—, que unifiquen, canalicen y promocionen las exportaciones de productos de la pesca. Medidas protectoras de desgravación a las exportaciones ayudan eficazmente al desarrollo de este Sector del comercio pesquero.

Resumen sobre la Organización y Administración del Puerto Pesquero

La Junta del Puerto de Vigo, es el organismo estatal autónomo encargado de la construcción, conservación y explotación del Puerto. En ella están representados tanto las Autoridades Administrativas relacionadas con el Puerto, como las Autoridades Locales y las Agrupaciones de los principales usuarios.

La Junta realiza directamente la administración del Puerto Pesquero, y presta los servicios de muel les, lonjas, agua potable y salada, electricidad y almacenes y oficinas para armadores, vendedores y exportadores. Los suministros de hielo, sal, combustible y pertrechos de todas clases, así como las instalaciones de congelación de pescado, reparación de buques y almacenamiento de pescado, están encomendados a empresas privadas, con control de tarifas por la Junta, para las que están instaladas en la zona portuaria. Otros Organismos de la Administración Pública, Comandancia de Marina y Sanidad, realizan funciones marítimas y sanitarias de inspección y control, o proporcionan —Sección de Trabajos Portuarios—, el personal eventual necesario para las descargas.

Los armadores, en la mayor parte de los casos representados por los consignatarios-vendedores, que se encargan del barco y del pescado a su llegada a puerto, realizan la descarga, clasificación, pesaje y venta del pescado, bajo la vigilancia y control de Agentes de la Junta, salvo en la Lonja de pesca litoral o de bajura, en la que

Fig. 7. Puerto pesquero de Vigo—Dársena núm. 4 de El Berbés y Lonja de altura, fábrica de hielo y almacenes-frigoríficos.

la Cofradía de Pescadores tiene concedida la explotación del edificio y realiza operaciones de control y cobro de tasas e impuestos bajo la vigilancia de los indicados Agentes de la Junta. Tambien efectúan el despacho del buque y su preparación, para la nueva salida a la mar, sin preocupación alguna para el armador, del que se convierte en verdadero administrador.

Los vendedores abonan a la Junta del Puerto o a la Cofradía de Pescadores las tarifas portuarias y coste de servicios, y los impuestos y cargas sociales, pagan a los armadores el importe líquido de las ventas, descontando una pequeña comisión porcentual —del 2 al 3,5 por ciento— y se subrogan en el cobro a los campradores de las ventas realizadas, recargadas con la tarifa portuaria sobre la pesca, a los que conceden facilidades de pago.

Los compradores, detallistas, y exportadores mayoristas o comparadores de fábricas, se encargan de la comercialización o industrialización del pescado.

Grandes empresas armadoras y cooperativas de armadores concentran sus esfuerzos en muchos aspectos de la administración de los buques pesqueros y sus capturas, suministros de todas clases de primeras materias, pertrechos, almacenamiento de pescado congelado y comercialización de la pesca, llegando, en ocasiones, a realizar directamente el ciclo completo de producción-consumo del pescado.

Del estudio de los resultados obtenidos, parece necesaria la concentración en la Autoridad Portuaria de todas las funciones que realizan otros Organismos de la Administración, y el estudio de la conveniencia de concertar en esta Junta o en otro Organismo la administración del mercado terminal pesquero, siempre que por su carácter profesional o cooperativo no exista en su funcionamiento espíritu de lucro, y se garantice el equilibrio de los intereses, en muchos casos encontrados, de armadores y compradores. Los intentos realizados hasta ahora en este sentido no han sido alentadores, por la eficaz organización de vendedores existentes en el Puerto Pesquero de Vigo, que defienden los intereses de los armadores y cuenta con su total confianza.

REGIMEN FINANCIERO

Los puertos constituyen un bien común, un capital de la sociedad, destinado a prestar un servicio público como eslabón principal en la cadena del transporte en el caso general, y en particular en el caso de los puertos pesqueros, como nexo fundamental de unión en el ciclo producción-consumo de los productos de la pesca.

Las diferencias que entre los puertos comerciales y los puertos pesqueros pueden establecerse, hacen fácilmente resaltar la importancia de éstos dentro del desarrollo económico de un país, al estar ligados a un ciclo productor y servir de introductores en el mercado nacional de una considerable cantidad de mercancías necesarias, de las que el armador no es solo transportista, si no pescador y propietario.

El Estado, u otros Organismos Públicos de análoga naturaleza, como promotores de los servicios públicos y del bienestar social de los ciudadanos, son los encargados de su construcción y financiación, en la forma y condiciones más adecuadas para el cumplimiento racional de su misión administradora de los bienes de la Nación.

Los proyectos de los puertos e instalaciones pesqueras tanto en los países desarrollados como en los que tienen que fomentarlo, y tanto si se trata de proyectos de ampliación como de nueva construcción, deben ser analizados y valorados, relacionando los beneficios futuros con los costes de inversión estimados, a fin de poder comparar su rentabilidad con la de otras inversiones en distintos sectores de la economía nacional y poder establecer criterios unitarios de prioridad y selección en las inversiones necesarias.

Los beneficiarios de los puertos y mercados terminales pesqueros no son solamente los armadores y compradores, usuarios inmediatos de sus obras e instalaciones, sino que existen amplios sectores industriales y comerciales cuyas actividades dependen de la pesca y de la cantidad, calidad y precio de sus productos, en los que el paso por el puerto pesquero puede tener decisiva influencia.

Junto a otros beneficios, la importancia que a nivel del país supone poder disponer de grandes cantidades de alimentos ricos en proteínas de producción nacional, a precios muy convenientes, evitando en muchos casos la necesidad de realizar importaciones de otros alimentos con precios más elevados, constituye un factor esencial desde el punto de vista de política social y económica de país, que debe tenerse muy presente al determinar la prioridad de las inversiones.

Es tendencia general que los usuarios de los servicios públicos financien directamente su coste, de forma que estos no se trasladen a los pagadores de impuestos y puedan causar perjuicios a otros sectores importantes de la Sociedad, necesitados tambien de los fondos del Estado.

La financiación de los puertos y terminales pesqueros hemos indicado que debe hacerse a cargo del Estado, por su condición de servicios públicos, para éste debe garantizarse la colaboración de los usuarios de las obras e instalaciones portuarias a través de unas tarifas adecuadas de utilización. Las aportaciones estatales, especialmente en todas las obras de infraestructura, es fundamental para que éstas pueden realizarse. La financiación con otros capitales nacionales o internacionales, exige un estudio previo de las condiciones de los préstamos que después de contar con el ahorro privado del país, debe canalizarse a través de organismos promotores del desarrollo, cuyas condiciones económicas impliquen ausencia de ánimo de lucro, y permitan el desenvolvimiento de los organismos administradores sin cargas excesivas sobre los usuarios.

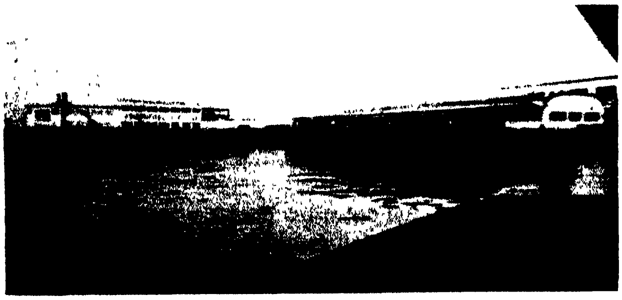

Fig. 8. Vista de una nave de la lonja de altura y de la fábrica de hielo y almacenes-frigoríficos de El Berbés.

Tambien podemos pensar en la construcción de puertos y terminales pesqueros, en régimen de concesión administrativa por entidades o empresas privadas, por medio de un concurso público para la prestación del servicio baja la vigilancia y control de la Administración, pero las grandes inversiones necesarias y el alto rendimiento exigible por el capital privado, conducirían probablemente a tasas de utilización excesivamente gravosas en régimen de monopolio, con probable primacía de los intereses económicos de la empresa sobre las necesidades del servicio público que deben prestar.

Regimen financiero de los puertos españoles

La Ley sobre régimen financiero de los puertos españoles, de 28 de enero de 1956, encomienda la financiación de los puertos e instalaciones marítimas de todas clases a las Juntas de Puertos, a que reiteradamente nos hemos referido en estas notas, dependientes del Ministerio de Obras Públicas.

Se establece en esta Ley el principio de la rentabilidad de las explotaciones portuarias, de forma que los productos de las mismas, obtenidos por aplicación de tarifas y cánones, cubran los gastos de dicha explotación y los de conservación y depreciación de los bienes e instalaciones del puerto, y proporcionen un rendimiento razonable de la inversión neta en activos fijos.

Es decir, que el usuario directo del servicio portuario deberá sufragar los costes de explotación y los gastos de conservación y reparación de las obras e instalaciones portuarias y la depreciación de las mismas materializada en las anualidades teóricas de amortización que permitirían la reposición del elemento amortizado al finalizar su vida útil. Este criterio facilmente comprensible en instalaciones, utillaje y obras de superestructura, debe considerarse igualmente en obras de infraestructura, cuya vida no es indefinida.

La exigibilidad de su rendimiento razonable, que en principio parece pensarse que alcance un máximo de un 5 por ciento sobre el capital neto inmovilizado, deducidas las amortizaciones anuales realizadas, parece debe estar en concordancia con los rendimientos análogos exigibles a otros servicios públicos de carácter general, especialmente los correspondientes a otros sectores del transporte, cuya coordinación debe figurar entre los objetivos fundamentales de la política económica del sector. Si las diferentes inversiones públicas han sido evaluadas con criterios análogos de rentabilidad interna de cada proyecto, alcanzándose tasas razonables de rendimiento, el principio establecido resulta correcto dentro de las inversiones públicas de la nación.

Los productos obtenidos en cada puerto se aplican, en primer lugar, a cubrir los gastos de explotación, conservación, gastos generales, impuestos y cargas económicas, administrativas y financieras. Se dotan seguidamente, un fondo especial "de regulación", hasta un 10 por ciento de los gastos normales del ejercicio por los conceptos anteriores, y un fondo "para reparaciónes extraordinarias e imprevistos" en una cuantía máxima acumulada comprendida entre el 20 y el 40 por ciento de los ingresos brutos del ejercicio anterior. Estos fondos responden a la

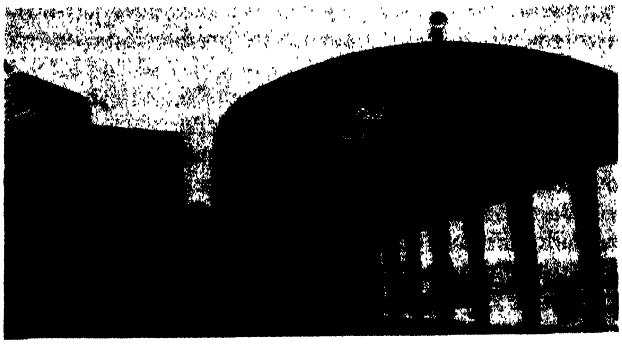

Fig. 9. Vista general de una nave de la lonja de pesca de altura y almacenes de exportadores mayoristas (Dársena 4).

necesidad normal en cualquier empresa de fondos de reserva que aseguren su estabilidad, tanto para prever dificultades de tesorería motivadas por irregularidades en la demanda de servicios o aumentos inesperados en los costes, como a la aparición de necesidades imprevistas o gastos extraordinarios debidos a accidentes o fenómenos naturales perjudiciales.

El excedente de cada ejercicio se destina a la ampliación y mejora de las instalaciones portuarias, hasta el límite de inversión fijado por el Gobierno en el plan financiero confeccionado para cada puerto. El remanente, si lo hubiere, se ingresaría en el Tesoro Público.

Las nuevas inversiones y gastos de primer establecimiento que requieran la creación, ampliación y mejora de los puertos, serán consecuencia de Planes Generales de obras y sus programas financieros propuestos por las Juntas de Puertos y aprobados por el Gobierno, que se realizarán con los recursos propios disponibles del organismo gestor, incluídos posibles empréstitos y compensaciones por enajenaciones de activos fijos, y las dotaciones que como subvenciones sin interés, se consignen en los Presupuestos Generales del Estado.

Los ingresos que se exigen a cada puerto no tienen relación con las necesidades de inversión que en el futuro puedan ser necesarias, sino que éstas se determinan independientemente en función de las previsiones y necesidades del tráfico y son recogidos en los planes generales de ampliación y mejora, antes indicados, y aquellos son consecuencia de la rentabilidad exigida por las inversiones realizadas. Las partidas de las tarifas portuarias derivadas de la depreciación de las obras e instalaciones portuarias o de sus anualidades de amortización, junto con el "rendimiento razonable" de los activos netos, constituye un fondo inicial de inversión, que concuerda con el carácter abstracto de fondo de reposición de obras e instalaciones que de su misma naturaleza se deduce. Las restantes necesidades de capital, son aportadas por el Estado a los patrimonios de las Juntas.

El caso de remanentes de explotación que deban revertir al Tesoro Público, solamente podría presentarse en puertos en que no sean precisas obras de ampliación y mejora, caso verdaderamente extraño en servicios públicos fundamentales como son los portuarios, pero la Ley prevé la revisión de las tarifas en los casos en que su rendimiento difiera en más o en menos del legalmente previsto.

El Gobierno, a través del Ministerio de Obras Públicas, se reserva el establecimiento de la política de tarifas portuarias en función de los objetivos que establezca de coordinación de transportes, debiendo informar las propuestas formuladas por las Juntas de acuerdo con los indicados objetivos, los Ministerios de Hacienda y Comercio (Subsecretaría de la Marina Mercante, oído el Consejo Superior de Cámaras de Comercio) y la Organización Sindical.

Tarifas por servicios a la pesca marítima

Las obras e instalaciones portuarias destinadas a la pesca, es decir, los puertos y mercados terminales pesqueros, están sometidos a la misma legislación financiera que los puertos comerciales y su gestión conjuntamente encomendada a la Junta del Puerto. La concentración del conjunto de las actividades portuarias bajo un único organismo, tiene indudables ventajas económicas, y dentro de una política de fijación de tarifas en relación con el coste real del servicio prestado, y factores de rentabilidad de la explotación ya indicados, permite una mayor coordinación de los servicios, y una cierta financiación complementaria en relación con la demanda y las circunstancias de los diferentes sectores del tráfico marítimo del puerto.

La tarifa general sobre la pesca comprende la entrada y estancia del buque, y el embarque, desembarque y transbordo de la pesca, en dársenas y zonas de manipulación en muelles pesqueros o habilitados, con sus servicios generales de policía, siendo sujeto pasivo obligado al pago el propietario de la pesca o la persona natural o jurídica que realice la operación.

La base para la aplicación de esta tarifa es la clase y peso de la pesca desembarcada o transbordada. Se mantiene así un criterio tradicional de ligar la tarifa portuaria al rendimiento de la pesca, haciéndola proporcional al pescado descargado, con independencia del tamaño del buque, pesquero y del período que dure su estancia normal en el puerto. De esta forma el pescador con menos suerte, en esta incierta aventura que es la pesca, queda en cierto modo desgravado aunque sea indirectamente a costa de sus compañeros más afortunados. En general, el pescador modesto que cuando pesca poco tiene una economía muy precaria, cuando las capturas son importantes se considera rico, y no le importa que en ese momento se concentre el pago de las tasas e impuestos correspondientes.

La dificultad de repartir las cargas equitativamente entre las diferentes clases de pesca, mantiene en estos momentos el abono de la tarifa en proporción al importe de las ventas, como es norma tradicional en la mayor parte de los puertos pesqueros, por lo que el criterio a que se alude en el párraio anterior alcanzó su plena efectividad, ya que la variación de los precios obtenidos por el pescado, puede, en muchas ocasiones, hacer resultar excesiva e incluso inaplicable una tarifa por unidad de peso, determinada con carácter general en unas condiciones normales medias de mercado. La cuantía de esta tarifa está fijada, en la actualidad, en el 2,08 por ciento del importe de la venta.

La pesca que no se cotiza normalmente en lonja, que es como se indica anteriormente, la de gran altura,—bacalao a media cura y pescado congelado—, abonan tarifas por tonelada a razón de 54,50 pesetas para el bacalao y 104,00 pesetas para el pescado congelado, cualquiera que sea su clase.

Los restantes servicios prestados por la Junta, tales como, suministro de agua potable o salada, energía eléctrica, maquinillas de descarga, básculas, departamentos y almacenes para exportadores y armadores, etc., se facturan de acuerdo con tarifas específicas calculadas y aprobadas en forma análoga a la indicada para las tarifas generales.

Los suministros de hielo, la congelación del pescado y su almacenamiento frigorífico, en instalaciones y obras construídas en la zona portuaria, tienen aprobadas por la Junta tarifas máximas, que actúan como reguladoras de servicios análogos que puedan prestarse desde la ciudad. Los suministros de combustible tienen tambien tarifa oficial fija.

Sin entrar en los rendimientos de las operaciones y sus costes detallados o globales, ajenas al alcance de estas consideraciones, resumimos a continuación algunas de las tarifas vigentes para los servicios individuales prestados:

Agua potable en el buque	10,00 Pts/Tm.
Agua salada	2,00 Pts/Tm.
Energía eléctrica	4,00 Pts/Kw. hora
Maquinillas para descarga de pescado	20,00 Pts/hora
Almacenes para exportadores, de dos plantas (según dimensiones)	750 o 2.500 Pts. mensuales
Almacenes para armadores (según situación)	15 o 20 Pts. por m/2 y mes.
Hielo (tarifa máxima)	200,00 Pts/Tm.
Congelación	0,50 Pts/Kg.
Almacenamiento frigorífico (según empresas)	200/300 Pts/Tm. y mes.
Gas-oil	1,71 Pts/litro
Fuel-oil	950,00 Pts/Tm.

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Les Ports de Pêche Français et Leurs Marchés

par P. Pouliot

Fishing ports in France and their market organization

This paper describes in some detail the present structure of the principal fishing ports in France. It describes the present fleet and landings at the principal port, Boulogne-sur-Mer. The basins and the quays are described and the facilities for handling the catches of wet fish. Current problems in handling and displaying the fish are described and the need for improvements and reductions in cost are referred to.

The administration and organization of the port is described. The fishing port is under the ownership of the Chamber of Commerce with the Government also having a role to play through the Service des Ponts et Chaussées, which is concerned with the harbour works and infrastructure. The Chamber of Commerce is responsible for the management of the fishing port, the equipment of the market hall, and it has recently installed a large box-washing machine.

The market system is described in some detail, including the system of price stabilization. Boulogne, by reason of its great importance, has a considerable effect upon the level of fish prices at other ports and every effort is made to stabilize the daily prices, particularly of herring and mackerel. The quality control scheme is referred to. The regional marketing commissions intervene in the market in order to compensate for losses due to excessive landings, for which purpose they have regional funds (FROM).

The author then similarly describes the port and market organizations at Concarneau, Lorient and La Rochelle, referring to their problems and characteristics. Finally, the author discusses generally the administration of these various ports and the roles of the State and local authorities. All these large fishing ports with the exception of Lorient, are administered by the Chambers of Commerce under the overall co-ordination of the State. Technical control is provided by the Service des Ponts at Chaussées and administrative and financial control by the Direction des Ports Maritimes du Ministère des Transports. Of particular interest in the final section of the paper, the author discusses the question of regional and national markets and particularly the influence of Paris in the French national market for fish.

Puertos pesqueros Franceses y la organización de sus mercados

El autor explica con algunos pormenores la estructura actual de los principales puertos pesqueros de Francia. Describe la flota y desembarques en el más importante de todos: Boulogne-sur-Mèr; las dársenas y muelles y las instalaciones para la manipulación de las capturas de pescado fresco. Menciona los problemas que actualmente plantea la manipulación y exhibición del pescado y la necesidad de efectuar mejoras y reducir los costos.

Describe la administración y organización del puerto, que es propiedad de la Cámara de Comercio, pero con participación del Gobierno mediante el Service des Ponts et Chaussées, que se ocupa de las obras portuarias y de la infraestructura. La Cámara de Comercio está encargada de la administración del puerto pesquero, el material de la lonja de pescado y, recientemente, ha instalado una gran máquina lavadora de cajas.

Se explica el sistema de mercadeo así como el de estabilización de precios. Por su gran importancia, Boulogne ejerce enorme influencia en el precio del pescado en otros puertos, por lo que se hace todo lo posible para estabilizarlos a diario, particularmente el del arenque y la caballa. Se menciona el plan de regulación de la calidad. Las comisiones de mercadeo regionales intervienen en el resarcir de las pérdidas causadas por desembarques excesivos, con cuyo objeto disponen de fondos regionales (FROM).

El autor pasa a reseñar la organización portuaria y de mercadeo en Concarneau, Lorient y La Rochelle, y señala sus problemas y sus características. Finalmente, menciona de manera general la administración de estos puertos y la función que desempeñan el Estado y las autoridades municipales. Todos estos grandes puertos pesqueros, exceptuado el de Lorient, los administran las cámaras de comercio bajo la coordinación general del Estado. De los aspectos técnicos se encarga el Service des Ponts et Chaussées, en tanto que de los administrativos y financieros se ocupa la Dirección de Puertos Marítimos del Ministerio de Transporte. En la sección final del trabajo, el autor estudia la cuestión, de especial interés, de los mercados regional y nacional y particularmente, el efecto de París en el mercado nacional de pescado de Francia.

BORDÉE par trois frontières maritimes, la France ne manque pas de ports de pêche, depuis les criques naturelles jusqu'aux havres artificiels.

De cet ensemble nous retiendrons les principaux d'entre eux à raison même de leur importance et de leur incidence sur l'économie française des pêches.

Dans l'ordre, nous citerons Boulogne, Concarneau, Lorient, La Rochelle, l'ensemble Dieppe Fecamp étant de plus en plus soumis à l'influence de Boulogne en ce qui concerne le marché du poisson vendu à l'état frais. Aujourd'hui se pose la question de savoir quelle reconversion peuvent opérer les ports spécialisés dans le commerce du poisson salé et si la trilogie Fecamp—Saint-Malo—Bordeaux pourra se maintenir ou si, au contraire, un arbitrage devra être opéré qui tiendra compte de l'introduction de la surgélation dans la pêche.

BOULOGNE-SUR-MER

Boulogne, ville de 80.000 habitants, implantée sur les rives de la Liane, est un port de pêche fort ancien dont l'activité a toujours été orientée vers la mer du Nord ou vers les bancs de l'Ouest de la Grande-Bretagne et de l'Irlande.

La salaison en mer ayant disparu parallèlement à la pêche aux filets dérivants, l'essentiel de la pêche est pratiquée par des chalutiers.

La flotte de pêche comprend deux éléments: la flotte industrielle et la flotte artisanale.

Le premier comporte aujourd'hui 54 bateaux de 450 à 2.000 cv alors qu'en 1960 on comptait 74 chalutiers classiques. Le chalutage par l'arrière est mis en oeuvre depuis 1964 et 10 unités représentant 20 pour cent du tonnage brut ont été mises en service, 4 autres devant être livrées en 1968. Les plus grands de ces navires sont conçus pour recevoir des installations de surgélation à bord, mais celles-ci ne seront mises en place que lorsque la situation du marché du poisson surgelé sera plus favorable qu'elle ne l'est aujourd'hui.

La deuxième comprend environ 110 bateaux de 50 à 480 cv dont la moitié a moins de 10 ans. Cette flotte est spécialisée dans la pêche côtière de poissons fins et de poissons saisonniers lorsque ceux-ci passent à proximité des côtes.

Alors que la flotte industrielle rapporte 90 pour cent des pêches vendues à Boulogne, la flotte artisanale ne livre que 10 per cent en tonnage mais environ 30 pour cent en valeur.

Sans doute la pêche livrée à Boulogne est-elle très diversifiée, ce qui est la caractéristique fondamentale de la pêche française. Néanmoins des espèces tendent à dominer encore qu l'on ne puisse affirmer la prédominance de certaines d'entre-elles, compte tenu des variations observées au cours de ces dernières années.

Dans l'ordre d'importance, nous citerons, pour l'année 1967:

lieus noirs	33.000 t.
merlan	22.000 t.
maquereaux	15.500 t.
harengs	13.500 t.

Les apports globaux s'étant élevés à 135.000 t., dont 7.800 t ont été livrées aux fabriques de sous-produits. Sans doute le tonnage non livré à la consommation humaine ne s'élève-t-il qu'à 5,7 pour cent des quantités débarquées ce qui peut paraître faible à côté de ce qui est généralement observé dans les grands ports du Nord de l'Europe, mais pour Boulogne cela représente un pourcentage élevé qui traduit assez bien la recherche de qualité poursuivie au port eu égard aux exigences de la clientèle au stade de la vente au détail.

Il convient de souligner la baisse importante (18 pour cent) des apports de gros poissons, alors que les années précédentes on avait observé un progression continue de cette production alors que regressaient les apports de poisson de surface. On peut dire en gros que le marché de Boulogne a été influencé par le cours du merlan qui s'est sérieusement redressé en 1967 (+29 pour cent), le prix moyen de ce poisson étant passé de 0,89 à 1,114 Frs. Ce relèvement du prix du merlan a permis de compenser en partie les pertes enregistrées sur les gros poissons, en particulier le lieu noir dont les excédents de pêche ont été livrés à la farine, et l'églefin dont les apports ont sensiblement regressé.

Les aménagements du port

Le port de pêche de Boulogne dispose de trois bassins:

- —un bassin à flot ayant 521 m de quais utilisables,
- —un bassin de marée offrant 475 m de quais pour la pêche,
- —un bassin (le bassin Loubet), précédemment utilisé par la flotte de commerce, et qui doit être transformé en bassin à flot par la construction d'une écluse. Pour ce dernier bassin la longueur de quais disponibles actuellement de 393 m (332 yds) sera portée à 1300 m (1430 yds).

C'est autour de cet ensemble de bassins qu'ont été édifiés tous les ateliers de travail de poisson et qu'ont été rebatis la gare de la SNCF et les quais de chargement des transport routiers.

Les halles de déchargement de poisson représentent actuellement une superficie de 14.220 m2 (1706 yds2) autour du bassin à flot. Ces halles, complètement ouvertes du côté du bassin, sont cloisonnées avec des volets roulants du côté des aires de circulation aménagées sous forme de quais en bout pour faciliter les transbordements des camions.

Une halle doit être édifiée le long du bassin Loubet qui complètera heureusement les installations actuelles qui sont insuffisantes les jours de gros apports.

Les engins de manutention comprennent 28 grues automotrices d'une force de 600 kgs (1320 lbs), 28 grues sur rail d'une force de 200 à 2.000 kgs (440 à 4400 lbs) 30 treuils et 7 sauterelles ou monte-charges inclinés destinés au déchargement des "caisses d'origine" (poids unitaire 25 kgs (55 lbs)).

Le poisson livré en vrac dans les cales est remonté sur les quais par des bennes métalliques soumises à un sérieux arrosage avant d'être déversé sur les tables de triage. Le poisson, après triage, est placé dans des coffres en plastique d'une contenance de 40 kg (88 lbs).

Le déchargement débute en général à minuit, sauf le samedi car la criée ne fonctionne pas le dimanche.

Ce travail de nuit permet de livrer dès le début de la matinée aux divers ateliers de mareyage, de filetage, ou de transformation (conserveries ou congélation).

La proportion de caisses d'origine, l'importance du tonnage livré en vrac et la diversité des espèces constituant un chargement ont évidemment une incidence sur la durée des déchargements. Malgré les améliorations apportées ces dernières années, la cadence du déchargement reste encore assez lente, car plus la pêche est diversifiée plus les opérations de tri sont longues.

Des pointeurs, à la solde des armateurs, vérifient la mise en coffre et la pesée de chaque espèce mise en coffre, et, pour chaque espèce, les catégories de taille.

D'autre part, le poisson mis en caisse à bord est également pointé.

En raison même de l'importance du tonnage mis à terre, il n'est pas procédé à la vente aux enchères autour des lots de poisson. Ceux-ci, mis en stock sur les quais de déchargement, font l'objet d'une vente en salle, alors que chaque acheteur a eu le temps de voir et d'apprécier les lots offerts à la vente.

On peut envisager une amélioration du rendement des opérations de déchargement et de tri du poisson en se servant des coffres à la place des bennes. Ce procédé permettrait de déverser environ 3 à 4 fois plus de poissons sur les tables de travail et de faciliter d'autant le triage. On éliminerait aussi le lavage du poisson qui a pour inconvénient de le réchauffer sous prétexte d'éliminer la glace qui l'enrobe.

Il a été essayé des tapis transporteurs à bandes en matière plastique sur lesquels les poissons sont déversés par une trieuse recevant le contenu des paniers remonté des cales. Jusqu'à présent les résultats observés n'ont pas été concluants, mais peut-être peut-on attribuer l'échec des essais aux craintes que la main-d'oeuvre a pu avoir d'être en partie éliminée dès lors que les opérations seraient accélérées par cette nouvelle méthode.

Les opérations de tri sont également un facteur de la durée des opérations de livraison. Il semble qu'en ce domaine on sacrifie peut-être plus à la tradition qu'aux véritables exigences de la clientèle.

Une diminution du nombre des tailles mareyables ou transformables résultant d'une normalisation bien étudiée devrait améliorer très sensiblement le rendement. Cette normalisation est en cours et doit être mise assez rapidement au point, car elle s'impose désormais dans le cadre des échanges intra et extra communautaires.

Cette normalisation aura également d'heureuses conséquences sur la mise en "caisse d'origine". Rappelons qu'il s'agit en l'occurence d'un poisson pré-mareyé, puisque une partie de l'équipage procède, à bord, au tri et à la mise en caisse du poisson pêché pendant les trois derniers jours d'un voyage. Certes ce procédé, qui améliore considérablement les conditions de conservation et de manutention du poisson est-il coûteux en personnel et en matériel, aussi faut-il ne l'appliquer qu'à bon escient en recherchant au maximum les conditions d'une bonne standardisation des matériels mis en oeuvre permettant l'emploi généralisé des procédés modernes de manutention, de levage et de transport.

Ce problème est d'autant plus important que la main-d'oeuvre que constituent les dockers poissonniers est onéreuse. Le coût élevé des dockers est dû pour une bonne part au fait que l'essentiel des apports est livré le lundi et le mercredi et que les autres jours les tonnages à débarquer sont mineurs. Il existe donc un minimum de personnel disponible qui est toujours insuffisant pour les jours d'apports abondants et qui est, par contre, en excédent les autres jours. Il peut paraître curieux qu'il en soit ainsi, mais il faut, dans ce domaine, ne pas perdre de vue que l'on se heurte à des traditions ancestrales et qu'en matière de produits non transformés et de nature périssable on ne peut assurer un écoulement sur les marchés de l'intérieur que dans la mesure où l'on peut livrer ceux-ci dans des délais normaux pour la mise a la disposition des consommateurs.

Il ne suffit donc pas d'établir une règle de répartition d'apports sensiblement égaux chaque jour de la semaine, il faut qu'à l'aval les acheteurs suivent.

Or, la tendance se dessine de plus en plus dans les pays industrialisés de réduire le nombre de jours ouvrables et d'allonger les repos de fin de semaine. Il faut bien reconnaître que ceci est difficilement conciliable avec ce qui précède—qui milite en faveur d'un élargissement du nombre de jours de marché.

Ce n'est, semble-t-il, que par un meilleur partage entre le mareyage et les industries de transformation, d'une part, et une accélération des acheminements par circuit court, d'autre part, que l'on peut escompter une distribution plus économique des produits de la pêche.

Administration et organisation du port

Le port de pêche est la propriété de la Chambre de Commerce qui assure les installations à terre et leur entretien.

L'Etat intervient par l'intermédiaire du service des Ponts et Chaussées qui assure le contrôle de tous les travaux d'infrastructure: écluse, bassins, quais. Le financement des opérations est assuré par la perception de taxes de péage qui assurent outre la couverture des frais courants, le Service financier des emprunts que la Chambre de Commerce est autorisée à contracter par l'Etat.

En dehors des prestations des installations portuaires et de l'outillage nécessaire aux manutentions, la Chambre de Commerce assure le recrutement du personnel nécessaire au fonctionnement de la criée et à la manutention à l'intérieur de la Halle. Au surplus un service administratif propre à la Halle et géré par la Chambre de Commerce assure la comptabilité de toutes les transactions portant sur les produits de pêche; ce même service sert à prélever toutes les cotisations et taxes professionnelles dues par les vendeurs et acheteurs et une organisation statistique, qui doit être prochainement doté de machine électroniques ultra-modernes, permettra de pousser aussi loin que possible l'analyse des divers éléments qui concourent à l'activité du Marché de Boulogne-sur-Mer.

Parmi les dernières réalisations de la Chambre de Commerce, il convient de citer la mise en place d'une machine à laver les coffres à poisson qui a un rendement de 1.200 coffres à l'heure et l'installation, avec le concours du Ministère de la Marine Marchande, d'un bassin d'essai de maquettes de chalut qui sert autant aux constructeurs qu'à la formation des jeunes marins qui séjournent à l'école d'apprentissage maritime.

LE MARCHE

Les apports sont répartis entre le mareyage et les industries de transformation, les surplus étant livrés, soit à l'exportation, soit aux fabriques de farine selon la nature et la qualité de ceux-ci. La libéralisation des échanges a eu pour effet d'attirer sur Boulogne de grandes quantités de poisson d'importation à raison même des prix moyens élevés généralement enregistrés sur ce marché et qui correspondent au niveau des prix habituellement observés en France pour les denrées de consommation.

La conjonction de la production locale et de l'importation conduit à une aggravation des écarts enregistrés de tout temps dans les arrivages sur le marché et à des excédents d'offre encore plus difficules à contrôler que par le passé.

On peut observer que le marché serait plus transparent si une meilleure information, venant compléter un plan de pêche préétabli, éclairait les acheteurs et donnait aux importateurs une indication suffisamment précise sur les possibilités de l'offre en égard à la demande. Cette remarque n'est vraie qu'en partie et il est trop simple de vouloir rechercher le remède aux soubresauts du marché dans la seule planification des voyages de pêche et dans une information plus généralisée et plus précise.

Remarque est faite sur ce point trop souvent oublié et qui est pourtant évident: dans une aire géographique relativement limitée, comme celle de l'Europe Occidentale Nord, les périodes de beau temps, pour la pêche s'entend, sont communes à tous les riverains. S'il y a excès d'apports, il s'ensuit une offre pléthorique généralisée. De même, en sens inverse, il peut y avoir une disette relative et une demande insatisfaite sur la plupart des marchés locaux.

Ce rappel d'une notion fort simple, qui pèse de tout son poids sur les transactions de poissons frais, montre que la mise en oeuvre d'organisations, de marchés et de systèmes de regulation de prix s'impose en vue d'obtenir une relative stabilité des cours du poisson frais que la stabilisation des produits, souvent considérée comme la panacée, ne suffit pas à assurer. Il suffit, en effet, de constater les désordres et les fluctuations importantes des cours des poissons surgelés sur les marchés d'Europe Occidentale pour être convaincus que si le stockage est un procédé pratique pour absorber des excédents très momentanés, il devient, par contre, rapidement dangereux pour l'économie d'un marché dès lors que les stocks s'accumulent et que rien ne laisse prévoir un arrêt de cette accumulation.

Boulogne, en raison même de son importance, a été conduit à rechercher un système d'équilibrage des cours en tenant compte, d'une part, de ses besoins pour les ateliers de mareyage, d'autre part, de la nécessité d'assurer un approvisionnement régulier des industries de transformation à des prix permettant de soutenir la concurrence des offres faites par les importateurs.

Tout d'abord, sur le plan privé, a été créée une Caisse de compensation pour le hareng, dont il faut rappeler l'importance dans l'activité boulonnaise qui compte de nombreux ateliers de salaison, de conserves et de semi-conserves.

Ce système a été étendu ensuite au maquereau, puis au colin noir et au cabillaud, en raison du développement pris par les préparations industrielles de ces poissons dont les apports allaient sans cesse croissants.

En cela l'organisation boulonnaise n'a rien de singulier, et l'on sait que des systèmes analogues ont été mis en place à Ostende, en Hollande et en Allemagne pour les mêmes raisons qui ont motivé l'initiative prise par le Syndicat des Armateurs de Boulogne.

Le mécanisme revient à garantir, d'une part, les besoins de la consommation à l'état frais et, d'autre part, ceux de l'industrie. Ces besoins étant couverts, il convient de retirer du marché les excédents et de leur trouver un exutoire, soit sur le marché international, soit sur le marché des usines à farine. Or, chacun sait que la caractéristique principale du marché international est d'être une braderie où sont offerts tous les surplus et que le marché de la farine est lui-même soumis aux pressions excercées par les excédents de production de quelques pays qui se sont suréquipés dans cette branche d'activité.

En définitive, il s'agit donc d'assurer une compensation des pertes subies du fait de la différence entre le prix offert sur ce marché normal et le prix possible obtenu sur le marché des surplus. On aperçoit que l'équilibre d'une telle opération est d'autant plus délicate à réaliser que la fourniture aux ateliers de transformation peut être assurée aussi bien par l'importation que par la production autochtone et que, de toute manière, un plafond est fixé pour le prix d'achat de la matière première, par le niveau de prix auquel est offert le produit fini qui peut être importé de n'importe où.

Quelles que soient les conditions dans lesquelles s'opère l'enlèvement des marchandises, dès lors que toutes les transactions sont contrôlées par la halle de vente, les cours qui s'établissent au cours des enchères sont influencés par les facilités ou les difficultés plus ou moins grandes rencontrées dans le placement des marchandises offertes.

Pour tenter de normaliser les apports et de les revaloriser, Boulogne a créé, tout d'abord, un service privé de contrôle de qualité dont le rôle est d'aller au delà d'un simple contrôle sanitaire et d'assurer un contrôle qualitatif des marchandises dignes d'être commercialisées. C'est ainsi qu'est retiré, sans appel, un certain pourcentage de poisson avant toute transaction; ce pourcentage est d'autant plus élevé que l'abondance de l'offre conduit à préserver le poisson de premier choix dont les cours pourraient être avilis par l'offre d'un excédent de marchandises.

Cette organisation de marché, d'abord privée, a été officialisée dans le cadre de la législation posée par l'Ordonnance du 14 avril 1945 qui constitue en quelque sorte la charte des pêches maritimes en France.

Des Commissions régionales de marché régissent et réglementent l'exercice de la pêche en fonction du marché et des Fonds régionaux d'Organisation de Marché (FROM) compensent dans une certaine mesure les pertes de recettes pouvant résulter des retraits de marchandises en quantités excédentaires.

L'intervention des FROM, sur les directives des Commissions régionales de marché, tend à régulariser la production, à l'orienter en promouvant la qualité. Elle a également pour effet de relever les prix de retrait, d'orienter la production, de développer la consommation et d'élargir les débouchés.

Un tel programme d'action ne peut s'appliquer, il va de soi, à une seule région dès lors que le marché intérieur est approvisionné par trois fronts de mer différents, ceci suppose donc qu'il y ait coordination des efforts des principaux marchés littoraux en vue d'équilibrer les mesures d'intervention dans les différents ports.

Certes l'organisation du marché de Boulogne est fondamentalement la plus importante, puisque l'on y commercialise les mêmes espèces que dans les ports d'Europe du Nord et que, par sa situation géographique, il est plus vite soumis aux pressions de l'importation. C'est d'ailleurs la raison pour laquelle l'organisation de marché a démarré dans ce port avant d'être étendue aux ports du littoral Ouest-Atlantique.

CONCARNEAU

Le port de Concarneau est un modèle d'organisation récente et dont le développement a été si rapide que plusieurs reconversions se sont imposées sous la pression du développement de la flotte de pêche et de sa capacité de production.

Alors qu'avant la deuxième guerre mondiale, Concarneau était essentiellement un port de pêches saisonnières (sardine et germon) avec une industrie de conserves à l'huile bien implantée, à la faveur du conflit et du repli des armateurs et des mareyeurs du Nord, d'abord, et de Lorient, ensuite, il s'est installé puis développée une activité de mareyage qui a permis l'essor d'une flotte de pêche fraîche.

Il suffit de se référer aux statistiques de la halle du port pour mesurer l'importance de l'évolution accomplie.

1938	6.000 t.
1950	18.600 t.
1960	48.000 t.
1964	59.500 t.
1967	66.000 t.

Les lieux de pêche exploités sont essentiellement ceux de l'entrée de la Manche, de la Grande et de la Petite Sole, la mer d'Irlande et la côte ouest d'Irlande—en ce qui concerne le poisson frais, le golfe Atlantique et la Côte occidentale d'Afrique pour la pêche du germon et de l'albacore—seule la pêche de la sardine est en recul; le développement des moyens industriels de production ayant montré la supériorité der endement des navires pouvant être exploités à longueur d'année.

Les variétés de poisson débarquées sont encore plus nombreuses que dans les ports du Nord, ce qui complique les conditions d'organisation de marché.

Les apports sont répartis sur les quatre premiers jours de la semaine, le lundi et le mercredi étant les jours les plus forts, mais l'écart avec les marchés du mardi et du jeudi est moins accentué qu'à Boulogne.

On compte en général:

16 à 20 bateaux le lundi	300 à 400 t.
12 à 14 bateaux le mardi	240 à 280 t.
12 à 16 bateaux le mercredi	240 à 320 t.
8 à 10 bateaux le jeudi	160 à 220 t.
6 à 8 bateaux le vendredi	50 à 80 t.
4 à 6 bateaux le samedi	40 à 60 t.

La moyenne des apports de chaque bateau oscille entre 18 à 30 tonnes, les plus forts tonnages étant de 50 t.

Le stockage du poisson dans les cales est en vrac, le procédé des caisses d'origine, qui suppose une standardisation des emballages, étant difficilement compatible avec l'échantillonnage encore un peu trop large de la flotte en exploitation—mais il faut noter que l'Armement Concarnois envisage l'emploi prochain de containers normalisés qui faciliteraient considérablement la manutention.

Le port ne comporte pas de bassin à flot, mais le développement des quais du bassin de marée, avec la reprise faite sur la partie large du Moros, assure une longueur de quais assez satisfaisante, et il est beaucoup moins fréquent qu'il y a cinq ans de voir les bateaux placés en épi.

Les halles de déchargement ont suivi le développement du port. Le quai du côté bassin est largement dimensionné, ce qui permet, en dehors des opérations de déchargement du poisson, d'opérer sans gêne toutes les opérations d'avitaillement des navires. La surface d'exposition du poisson mis en vente est largement calculée, le sol est parfaitement revêtu et d'un nettoyage facile, l'éclairage est excellent. Du côté opposé au bassin se trouvent les magasins de marée avec desserte immédiate de la voie ferrée et aménagement de quais en bout pour le chargement des camions.

Toute la manutention est assurée au moyen de récipients en matière plastique, les uns en forme de paniers, les autres en forme de coffres, soit de 40 kgs, soit de 20 kgs de capacité. Le personnel de déchargement est recruté et géré par une société créée par les armateurs et administrée pour leur compte par les services de la Chambre de Commerce qui gèrent la Halle. Complètement indépendants jusqu'à ce jour de la Fédération des ports et docks, les ouvriers poissonniers se sont révélés plus stables que les dockers des autres ports. Peut-être faut-il attribuer cette stabilité en partie à la meilleure répartition des apports, puisque, ainsi qu'on l'a vu plus haut, la différence entre les premiers jours de la semaine est beaucoup moins accentuée qu'à Boulogne, par exemple, et ceci tempère les écarts de salaires journaliers.

Grâce à une organisation très remarquable des enlèvements de poisson au fur et à mesure des ventes, et ceci malgré la très grande diversité des lots de poisson mis en vente, le port de Concarneau est à même de développer la commercialisation des produits de pêche, et il n'hésite pas, pour ce faire, à envisager les méthodes les plus modernes.

L'organisation du marché

Devant le développement rapide de sa production et à cause de l'introduction sur son marché de tonnages importants de colin noir, cabillaud, églefin et de merlan, espèces qui dominent également le marché de Boulogne, Concarneau a été conduit, en s'inspirant de ce qui avait été fait pour le grand port du Nord, à créer un fonds régional qui est régi par la Commission Régionale de Bretagne.

Cette Commission mise en place fin 1966 a commencé à fonctionner en 1967. Son action a été orientée vers la politique de qualité, la régularisation de la commercialisation, et le soutien des cours.

Le contrôle de la qualité a été coordonné entre les ports de Douarnenez, Concarneau et Lorient dans le but de normaliser les expéditions faites par ces trois ports sur les marchés de l'intérieur. En dehors du contrôle effectué par des praticiens compétents, une réglementation plus sévère de la durée des sorties des bateaux, limitant celles-ci à 15 jours au maximum, a été mise parallèlement en vigueur. Des primes d'incitation ont été instituées pour encourager les patrons de pêche à raccourcir la durée de leur voyage.

Sur le plan de la commercialisation, la Commission Régionale a fixé des normes en collaboration avec les mareyeurs. D'autre part, elle s'est efforcée d'étaler les apports au cours de la semaine pour en faciliter l'absorption et d'obtenir que les bateaux annoncent plus régulièrement et avec moins de fantaisie les tonnages qu'ils rapportent.

Enfin, par homogénéité avec les règles posées par la Commission Régionale Nord, des prix de retrait ont été fixés pour les mêmes espèces que cette dernière soutient.

Sur le plan de la qualité, les progrès enregistrés sont incontestables et, sur le plan commercial, malgré la grève de février 1967 et la mévente provoquée par la marée noire, on a enregistré un relèvement des prix moyens au débarquement: +11 pour cent pour le poisson de fond et +4 pour cent pour le maquereau.

Ces résultats sont encourageants, mais, en raison de leurs moyens d'action limités, on peut penser qu'aussi longtemps que la politique commune des pêches et ses implications n'auront pas commencé à jouer, l'action de la Commission Régionale de Bretagne et du Fonds d'organisation de marché sera avant tout d'assurer la survie de ce qui existe en attendant qu'une harmonisation de la concurrence permette d'entrevoir une reprise de l'expansion.

LORIENT

Le port de Lorient est le seul grand port de pêche français qui ne soit pas géré par une Chambre de Commerce. Créé et réalisé par l'Etat il a été affermé à une Société d'Exploitation qui assume la gestion complète du port, de l'entrepôt frigorifique, la fourniture de la glace et la prestation de main-d'oeuvre nécessaire aux manipulations du poisson entre les gros navires et les magasins de marée. Ces derniers sont implantés sur de larges quais dont un côté donne sur les bassins et l'autre bord sur les voies de chargement et le parking des transports routiers. Il y a au total 1.800 m. de quais disponibles, longueur qui s'avère insuffisante les jours de pointe, c'est-à-dire le lundi et le mercredi.

La flotte livrant à Lorient comprend 170 chalutiers de pêche industrielle et 100 chalutiers côtiers. Dans ces chiffres sont comptés des navires des ports artisanaux environnants dont la puissance de marché a été anéantie par la guerre et dont les armateurs ne se servent que pour les travaux d'entretien. Le tonnage débarqué a été de 54.000 t en 1967.

Les lieux de pêche sont, au Nord, les mêmes que ceux fréquentés par les bateaux de Concarneau, mais une partie des chalutiers les plus forts sont dirigés vers le golfe de Gascogne et le Portugal à la recherche du merlu notamment.

La manutention du poisson se fait dans des coffres en plastique. Du point de vue main-d'oeuvre, seuls les chalutiers armés au salaire minimum garanti sont desservis par les ouvriers dockers fournis par la Société du port de pêche. Les bateaux armés "à la part", de même que les bateaux de pêche côtière sont déchargés ou par l'équipage ou par du personnel rémunéré directement par l'armement.

Pour pallier une partie des inconvénients résultant de l'insuffisance des surfaces de magasins de marée, les opérations de déchargement et de manutention ont été particulièrement étudiées à Lorient et c'est ainsi que sont expérimentés des systèmes de manutention continue de cale à quai et que sont mis en oeuvre des chariots à palettes.

L'organisation du marché de Lorient relève de la Commission Régionale de Bretagne et, de ce fait, elle suit les mêmes règles qu'à Concarneau. L'existence de chalutiers de plus fort tonnage conduit à développer les captures de cabillaud et de colins noirs dont les apports peuvent excéder les besoins de la marée fraîche. Aussi certains ateliers coopératifs ont été organisés par l'Armement en vue d'assumer la transformation de ces excédents pour leur exportation.

LA ROCHELLE

Le plus ancien des grands ports de pêche du littoral Atlantique, La Rochelle connaît, depuis la fin de la seconde guerre mondiale, un certain recul dû à l'appauvrissement des fonds de pêche qu'il exploite dans le golfe Atlantique.

Le tonnage livré à la Halle s'est élevé à 23.000 t en 1967. Cette faiblesse est compensée en partie par un prix moyen élevé au débarquement: 2,83 Frs au kilo, chiffre le plus élevé de tous les ports français. Cette caractéristique tient au fait que les principaux apports sont constitués par trois poissons de valeur, le merlu, la dorade et la sole.

La flotte de pêche comprend 59 chalutiers de 350 à 1200 cv et 44 chalutiers d'une puissance inférieure à 350 cv auxquels il faut ajouter 60 petits bateaux de pêche côtière qui alimentent le marché en poisson très fin. La Halle de La Rochelle reçoit, en outre, les apports des bateaux de l'Ile d'Yeu, des Sables d'Olonne, voire d'Etel, lorsque ces derniers travaillent dans le centre du golfe.

Les périodes de gros apports sont les mois de mars et avril et les plus fortes livraisons ont lieu le lundi et le mercredi, mais chaque bateau ne rapporte que des tonnages assez faibles oscillant entre 9 t et 20 t.

L'exploitation du port souffre de l'existence d'un seul bassin à flot pour accueillir les navires de commerce et les bateaux de pêche, ce qui conduit à des manoeuvres continuelles de changement de poste à quai qui entravent toutes les opérations d'avitaillement des navires de pêche.

Par contre, la Halle, édifiée le long du quai Est du bassin à flot, est de construction moderne. Elle comprend, du côté bassin, un hall couvert d'exposition pour tous les lots de poisson mis en vente, les magasins de marée et, du côté terre, les voies ferrées avec la particularité d'un auvent de protection pour la voie qui jouxte les magasins.

Les largeurs des quais ont été réduites au strict nécessaire pour la commodité des évolutions, de sorte que le minimum de temps est perdu dans les operations de déchargement et de mise du poisson à la disposition des trieurs.

La sortie du poisson des cales est faite avec des paniers en osier, mais après déglaçage et triage, le poisson est présenté à la vente par lots de coffres en plastique de 50 kgs de contenance. Ces coffres ne sont pas pesés et c'est à l'acheteur d'apprécier leur remplissage.

Comme à Lorient, les manutentions du bord à quai sont faites par des équipes spéciales pour les gros bateaux armés au salaire garanti, alors que c'est l'équipage qui les assure à bord des chalutiers armés à la part. Dans ce dernier cas, il semble que le poisson est traité avec plus de soin, étant donné l'intérêt plus direct qu'ont les hommes à valoriser au maximum le poisson qu'ils rapportent.

Ce n'est qu'après déglaçage du poisson et décrochage des paniers sur le quai que les employés de la Chambre de Commerce prennent le poisson en charge pour le livrer aux trieurs, l'exposer en lots pour la criée et le livrer finalement aux mareyeurs.

A la différence de ce qui se passe dans les autres ports précédemment cités, la main-d'oeuvre chargée de la manutention et du tri n'est pas facturée directement aux utilisateurs. Les frais sont couverts par une taxe à la caisse de poisson vendue par les armateurs et à la caisse de poisson achetée par les mareyeurs. Ce procédé permet d'éviter l'affectation "ne varietur" à un poste déterminé et il autorise, au contraire, suivant les besoins du moment, de déplacer la main-d'oeuvre vers les postes où les besoins les plus urgents se font sentir.

La concentration des installations est un atour majeur du port de La Rochelle et, si l'on ajoute la faiblesse relative des tonnages manipulés par rapport à ceux des autres grands ports, il y a un avantage supplémentaire pour les mareyeurs qui peuvent apporter le maximum de soins à la présentation du poisson qu'ils expédient. C'est l'un des facteurs qui contribuent le plus à la proportion dominante des ventes à prix ferme aux acheteurs de l'intérieur par rapport aux ventes à la commission sur les halles des grands centres urbains.

ADMINISTRATION DES PORTS

Comme on vient de le voir, à l'exception de Lorient, tous les grands ports de pêche sont administrés par les Chambres de Commerce et d'Industrie.

Sur le plan financier, les frais des grands travaux d'infrastructure et, à fortiori, les dépenses d'équipement et d'outillage sont à la charge des usagers qui ont à payer des taxes de péage en fonction du tonnage qu'ils exploitent et de l'importance des mises à terre qu'ils effectuent. Toutes les prestations de service qui sont assurées par l'intermédiaire de l'organisme de gestion de la Halle, de même que les frais d'utilisation de l'outillage du port sont supportés par les usagers.

L'intervention de l'Etat se limite aux seules opérations de contrôle.

Le contrôle technique est assumé par le service des Ponts et Chaussées, de même que le contrôle administratif et financier est exercé par la Direction des Ports Maritimes du Ministère des Transports.

C'est ainsi que toute initiative des Chambres de Commerce, sur le plan financier, est contrôlée par l'Etat dont la tutelle constitue une protection pour les usagers, mais tutelle qui peut devenir un frein lorsque des obstacles sont apportés à la réalisation d'emprunts qui peuvent éventuellement gêner les desseins de l'Administration des Finances. Le régime financier des ports a été modifié par la Loi du 28 décembre 1967; certains textes d'application relatifs aux droits de port et de navigation ont été promulgués, mais d'autres règlements sont encore attendus. En gros l'on peut dire que les taux des redevances d'équipement des ports perçues sur les marchandises débarquées sont fixés, pour chaque port, par Arrêté des Ministres des Transports et de l'Economie et des Finances, alors que les droits sur les navires sont fixés par la Loi elle-même. Dans les deux cas, le montant des taxes est perçu par les services de la Douane, mais, alors que les droits sur les navires sont acquis à l'Etat, les taxes sur les marchandises le sont au profit des collectivités ou établissements publics qui participent au financement des travaux du port.

Il convient de souligner que le mode de financement des infrastructures portuaires en France exerce une pression importante sur le coût de l'exploitation des navires de pêche. La charge qui pèse sur la première transaction dont est l'objet le poisson est de l'ordre de 2 pour cent de la valeur du poisson débarqué.

Organisation des marchés regionaux et nationaux

A l'occasion de la revue des différents ports, il a été indiqué les voies dans lesquelles s'étaient engagés les professionnels en vue de régulariser leurs marchés. L'exemple le plus développé est celui de Boulogne, où l'organisation de marché a pris naissance, les autres ports n'ayant fait que s'inspirer de ce qui avait été déjà fait.

Mais il faut noter qu'en France le principal marché qui pèse sur les cours est celui de Paris qui reçoit à la fois les envois de pêche française et ceux de l'importation. Ce n'est pas que Paris manipule des tonnages aussi importants que ceux de Boulogne, mais en saison d'hiver, les jours de pointe, les quantités offertes aux Halles Centrales de Paris peuvent atteindre 600 tonnes et quelquefois plus. Il s'ensuit que les livraisons téléphoniques inter-ports et les Halles de Paris tendent à déterminer les cours dans les ports en fonction de la concentration des renseignements accumulés par les dirigeants du marché parisien.

L'extension de la région parisienne due au développement des moyens de transport rapides, d'une part, et à la création de villes nouvelles dans un rayon de 80 km autour de la capitale, d'autre part, ne peuvent que renforcer la prédominance du Marché parisien. C'est pourquoi le transfert des Halles Centrales en dehors de la capitale s'imposait plus que jamais et que la solution de Rungis a été adoptée.

Il est donc plus que probable que le Marché de Rungis sera appelé à devenir un centre de transactions encore plus important que ne l'était celui des Halles Centrales, et l'on peut même penser qu'il doit devenir le principal marché du réassortiment en produits de la mer d'Europe occidentale.

C'est pourquoi les professionnels de la pêche, Armateurs et Mareyeurs, ont été invités par l'Etat à se faire représenter à Rungis en vue de s'intégrer davantage dans les transactions sur les produits de la pêche.

Les Armateurs, en particulier, ont tout de suite saisi l'intérêt de l'installation d'un poste d'observation aussi avancé dans l'intérieur, car ils peuvent y trouver l'occasion de coordonner davantage leur action sur le marché en associant étroitement les Fonds d'organisation de marché au fonctionnement du poste créé à Rungis.

Il n'est pas question de substituer au Commerce de gros traditionnel qui connaît parfaitement la clientèle de vente au détail un organisme au profit exclusif des producteurs et expéditeurs de poisson. Il s'agit d'organiser un système d'entrepôt destiné à réalimenter les grossistes selon leurs besoins et à permettre les réassortiments nécessaires à l'exportation.

Au surplus, dans l'esprit des promoteurs de cette organisation commerciale nouvelle qui devrait normalement entrer en activité au cours du premier semestre 1969, Rungis devrait devenir pour chacun le centre de renseignements idéal dans lequel seraient concentrées toutes les informations relatives à la production, à l'importation et aux exportations. Ainsi le marché national serait-il plus transparent et pourrait-il être mieux outillé pour répondre aux besoins que ne manquera pas de susciter la mise en oeuvre du marché commun des produits de la pêche.

Sans doute peut-il paraître insolite de terminer une revue des principaux ports de pêche français et de leurs marchés en concluant sur les possibilités et les perspectives qu'offre la création d'un Marché d'intérêt national situé aux portes de Paris. Mais il semble difficile, du moins dans la structure présente de l'économie française des pêches maritimes, de ne pas tenir compte de cet état de fait qui consacre une situation déjà connue dans le passé et qui tient compte du développement de l'urbanisme de demain.

DISCUSSION

HARBOUR ADMINISTRATION AND CONTROL

Pérez Bellod (Spain—Chairman) said the purpose of Conference should not be to determine what were the best administration systems for ports. There were many different systems; each country had developed its own and it was the aim of Conference to give the results so that countries that did not possess adequate administration for their fishing ports could take advantage of such experiences to try and set up their own organizations, adapting them to their own needs.

First the functions of this administration should be defined and established. The port was a live organism, and required maintenance services and plans for its extension or enlargement. There were also certain limitations which one had to

impose on individual concerns for the benefit of all—such as mooring of vessels, health control, so that the catch was fit for human consumption. Sometimes the size and volume of the catch had to be controlled in accordance with national regulations as well as international agreements for the protection of fisheries. Furthermore, perhaps the administration would have to allocate its own land for fishing terminals, cold storage facilities; in other words, ancillary industries. No doubt organizations that had participated in the financing might want to exert a certain control, or participate in administration in order to achieve the economic and also social aims desired. Conference should also consider the advantages and disadvantages of the various administrative systems in existence.

Three main methods

Gudmundsson (Iceland) (Rapporteur) said that there were no less than 17 papers dealing with the subject of the session. He thought he was correct in stating that, with very few exceptions, the administration was dealt with in one of the following ways.

1. by central or local government or some combination of both
2. by companies which had in some way or another acquired the right to administer facilities built by the government
3. by harbour commission or trawler-owners.

Meiners (Federal Republic of Germany) amplified on the paper by Fishing Port Management Co. Ltd. (Session XIV) by stating how matters were settled in Bremerhaven and also in Cuxhaven, Hamburg and Kiel. They had a public administration of the port and the fish marketing company was also a port marketing company. The tasks of the public agency approximated the following: it administered technically the port, and it was responsible for its extension and structural changes. It looked after matters from the administrative as well as from the civil engineering point of view. It had to maintain the locks and the quays, and the other facilities without which a port could not work, such as cranes and other installations. In the fishery ports, the procedure was as follows. The company's only partner was the local Land, for instance, for Bremerhaven the Land of Bremen, and it was solely responsible for the port administration in the Land concerned. For that purpose the company received the port facilities on a lease basis. The companies had to see to it that the buildings leased to them were properly and adequately maintained. According to private commercial law they were limited companies and organized in the same way as private enterprises were organized. They had to cater for the costs of everything which was not part of the infrastructure, and they had to do so on the basis of their income from leasing these facilities to the various enterprises in the ports.

Order of berthing

Beattie (UK) asked if fishing vessels should berth in the order in which they arrived or should priority be given to local vessels. There were three classes of vessels, home vessels, vessels of the same nationality but from other ports, and foreign vessels. One school of thought argued that local vessels should have priority and thus obtain better prices for their catch. This view was, however, opposed by others.

Hauke (Federal Republic of Germany) said that in the business regulations and statutes in use in Cuxhaven it was clearly expressed that the ships should be dealt with in order of arrival. It was considered this was part of the service and no exceptions were admitted unless certain technical problems made it necessary to give up this principle.

Lindskog (Sweden), on foreign boats having the same rights as national boats, said that in Sweden, in principle, the same treatment was given to both categories. The same system was used in Denmark at Skagen, Hirtshals and Hanstholm, where Swedish, Norwegian and Faroe Islands boats landed together with the Danish boats and had the same rights. In this connection it should be noted that for herring, in Sweden, they had a pool every day and all landings during one day obtained the same price.

Weight or value basis?

Beattie (UK) asked whether the dues levied by the port authority on fishing vessels and on their catch should be levied by reference to **weight** or **value**.

Meiners (Federal Republic of Germany) remarked in reply, that since 1936 at Bremerhaven they had considered this problem quite frequently. He observed that as far as the question of auction fees was concerned, these fees would increase with a rising price level if they were levied according to value. If, on the other hand, the dues were levied according to weight it was usually necessary to increase the rates more often which might meet with some opposition. He thought, however, that a system with dues paid on a weight basis generally operated quite easily.

Goldet (France) said that since 14 September 1968, in all French ports a due was levied on the value of fish and this was used for financing the port and for servicing the loans. There was no controversy on this any longer in France because fees and dues were based on value but for handling there existed also a special fee. This was paid in the auction and referred to the sales of fish. These dues were more or less based on value, however, with the exception of the port of La Rochelle where there was still a fee on a weight basis. In France it was thought that the more expensive the fish was, the easier the fees levied on it could be increased and thereby increase its contribution to maintaining the port. The service rendered to expensive fish was naturally the same as that for the less expensive, but he felt it was still possible to increase fees on the more expensive fish.

Paid by user and state

On general administration of ports, he thought that costs, could to a certain extent, be paid for by the users and the remainder be covered by the State. This practice might lead to conflict between local users, looking after their own interests and neglecting the general problems, and a central body ignoring the local interest. Meiners stated that in Bremerhaven and in the big ports they had managing societies or companies where users had their say and where there was a certain influence of the public authority. Such an intermediary organization would be most useful. In France the system was similar. There the chambers of commerce represented interests of users and it was believed that through these channels problems could best be solved.

Exon (UK) said he favoured dues being paid on a weight basis. This was done in England and operated easily and efficiently, particularly on the auction system. If paid on value, he felt it ceased to be a due and it became something akin to a gains tax.

Hildebrandt (Netherlands) believed the best way might be to charge what the traffic could bear. Cheap mass-fish could not bear a levy on the basis of weight, though cheap mass-fish required the same services as luxury fish. He favoured a levy on value.

Competitive ports

Fulham (USA) said that on the Boston Fish Pier, which was a strictly private operation, two fees were charged, a wharfage fee paid on a poundage basis, and an exchange fee paid on an **ad valorem** percentage basis. There was never any difficulty with the exchange fee but changes in the wharfage fee caused problems. They believed that in future, if there was any change in the system, all charges would be put on the *ad valorem* percentage basis.

Meiners (Federal Republic of Germany) said there was a risk that ports and port markets located relatively close to each other might compete to attract customers by not applying the same dues. In the four large German markets and fishing ports, the matter had been solved through close co-operation between the ports in certain sectors. It was not only a matter of a common wage policy, but also wage scales for workers in all categories were settled in one contract for all four companies. One important cost factor was thus always the same in all ports. Port dues were also put on the same level, using the cost of the most favourable market as a basis. In this way it was not envisaged any more that because of different levies the vessels would not go to their home base and unload but perhaps to a neighbouring port and sell their fish there. Were similar systems in existence in other ports?

Lafouge (France) pointed out that in general all systems of port levies took into account the value of the goods, because although they were based on weight, the rates differed according to the nature of the commodities and they were always higher on the more expensive goods.

Berenguer Botija (Spain) said that levies by weight or by value were closely connected with the sale system in existence, either on a fixed price basis or by auction. On the first method, if it was based on value actually it amounted to the same thing as paying by weight, bearing in mind the quality of the different species, and their value. If value was used there was no doubt that gains were taxed in the case of high prices, but when there were only low prices this levy could be better borne.

Cox (UK) said that the British Transport Docks Board, although technically managers of the dock, did not provide all the facilities needed. They provided quays, cranes, etc., but the major facilities for servicing vessels were provided by the producers themselves, many of which operated through his Association. Whatever the Board provided, whether it was a new quay space or repairs, they operated as a commercial undertaking and the ultimate costs were borne by private producers through dues and charges fixed by the Board on a level to recover their expenditure.

Trans-shipment ports?

Hjul (UK) remarked that in recent years the great increase in long range ocean fishing operations had created a need for trans-shipment ports in countries adjoining productive grounds. Trans-shipment of catches could improve the economy of the catcher boat, permitting intensive use in fishing. Port authorities were tempted to permit this, but it had been opposed by the fishing industries of the littoral countries. Thus, in South Africa, pressure from the fishing industry succeeded in raising port dues for foreign trawlers trans-shipped by about 500 per cent. Then counter pressure from port service companies got the dues reduced again.

In other countries trans-shipment was prohibited. He believed this was the case in Newfoundland, but nearby French islands permitted trans-shipment. These differing policies resulted in differences in the success of long-range fishing. They could encourage the development of ports designed to attract such traffic. Somalia, for example, had a port with facilities intended to service foreign fishing vessels working in the Indian Ocean.

Favazza (USA) drew the attention to the fact that in Gloucester, Massachusetts, fishing vessels did not pay any dues whatsoever, and Gloucester had just attracted the first American factory ship because free use of the State Fish Pier had been offered. The State Fish Pier Authority's income came from rents collected from processors located at the Pier facility. It was presumed the processor's rent included the privilege of unloading the boats selling to the processor.

Attraction of cheapness

Goldet (France) said that if two adjacent ports offering the same facilities applied different rates, then vessels would tend to go to the cheaper port and neglect the neighbouring port, which after a time would mean that it could not keep up its repayment of debts. The situation would become serious and to solve this problem, and to leave some freedom to each port in levying its dues, French law had provided that if a ship having its home base in one port went to another port and landed its catch there then the taxes the ship would have to pay would correspond to the taxes applied in the most expensive of the two ports. The tax thus collected was shared proportionately between the ports. He wondered whether similar systems existed in other countries. The United States example would be impossible in France because of the method outlined.

Hauke (Federal Republic of Germany) thought that from all the remarks made so far he gathered that in no case were the fees and dues charged really cost covering; there was more or less open or hidden subsidy paid to the port management. If there were two neighbouring ports levying different fees and dues, he held that these ports really stood too much in competition with each other, which might even bring about a complete failure of one or even both of the ports.

Hildebrandt (Netherlands) said that not only was a due on weight or value possible, but there was also a possibility of a fixed amount per unit of weight combined with a levy *ad valorem*. This was a system that Riem Vis, Director of the auction of Scheveningen recommended.

Gudmondsson (Iceland) said in Iceland they did not have all the mentioned systems; in some ports there were no levies at all on landed fish and in some, levies were according to weight and according to value in others.

It was the experience there especially, during the cod fishing season, that fishermen landed their catches at the port nearest to the fishing grounds or where they could unload most rapidly, irrespective of harbour dues. This was partly explained by a competition between skippers on the quantity caught.

Beattie (UK) said that the advantages of assessing dues on value instead of on weight were that as the price of fish varied so did the total dues thereon. In other words, if the owner of the fish obtained a poor price, he paid a smaller amount in dues. If he obtained a good price, the port authority shared in his prosperity by getting higher dues. The rates structures at ports which levied dues by weight were drawn up by reference to the value of each commodity and this in effect was fixing rates by value.

SESSION XIV

Organization and tasks of the Fishing Port Management Company Limited, Bremerhaven

by Fishing Port Management Co., Ltd.

Organisation et fonctions de la Compagnie D'Administration du port de pêche de Bremerhaven

La présente communication décrit le statut légal et les activités de la Compagnie d'administration du port de pêche de Bremerhaven, (Fischereihafen-Betriebsgesellschaft mbH, Bremerhaven).

Organización y funciones de la Compania Administradora del puerto pesquero de Bremerhaven

Este trabajo describe para los participantes el estatuto legal y actividades de la Compañía Administradora del Puerto Pesquero de Bremerhaven (Fischereihafen-Betriebsgesellschaft mhB, Bremerhaven).

IN the Federal Republic of Germany, there are sea-fish markets at Bremerhaven, Cuxhaven, Hamburg and Kiel in the four coastal Lands of Bremen, Lower Saxony, Hamburg and Schleswig-Holstein. The management companies of these markets are united in the Conference of German Sea-Fish Market Companies. Apart from slight differences, these fish market companies have a uniform organization and economic structure.

The fishing ports with their varied installations and equipment are owned by the coastal Lands which use market companies under private law for economic activities.

In Bremerhaven, it is the Fishing Port Management Company Ltd. of Bremerhaven, operating under private law, and as a private enterprise incorporated in the commercial register-general. The Land of Bremen is its only partner. This results in two legal situations, to wit:

(a) In **public law**: the Land of Bremen (authority), under an agreement, has handed over the fishery shore installations owned by the Land of Bremen to the market company for management and use. In return, the market company has to pay compensation agreed upon separately (rent payments) and has to pay a fixed annual amount into a so-called renewal fund for upkeep of the installations

(b) In **private law**: the market company operates exclusively under private law in respect of the users of its services, according to its own conditions governing use and business. The company calculates payments on the basis of its tariff. The company is bound to fix the amounts according to the principle that revenue should cover costs, so that surpluses should not be achieved. However, if they do arise, they must be transferred to the owner (Land of Bremen), under the agreement with the Land.

ACTIVITIES OF THE MARKET COMPANY

These are as follows:

(a) Management, administration and maintenance of the fishery shore installations handed over to the market company, including letting and leasing of same, supply of power and water, harbour railway, sewerage, and upkeep of roads

(b) Unloading, loading, auctioning, distribution, or any other service in the sale of fish delivered to the saltwater fish market by water or land, of other sea products, and of products made from fish or other sea products

(c) Support of measures promoting fisheries and the sale of saltwater fish.

In addition to its economic activities, the company obtains its revenue mainly from the letting and leasing of state installations. Apart from publicly-owned buildings, privately used buildings may be erected on state-owned land, on so-called hereditary plots.

The administration of water areas, embankments and locks is undertaken by the owner of the harbour. This is done by the Office of the Hanseatic City of Bremen at Bremerhaven, an office of the Land.

Public fish auctions are an important activity of the market company. In addition to all branches of producers (ocean-going fishing, luggers, cutters and importers), those admitted comprise all sea-fish wholesalers registered on the four sea-fish markets, industries, and local fish retailers. Purchase of goods depends on the bid at the auction.

German high-sea fisheries accounted for 79 per cent, or about 90,000 tons, of the goods offered for auction on the Bremerhaven saltwater fish market in 1967. Since July 1, 1960, German high-sea fisheries have been selling their goods on all four fish markets of the Federal Republic through Saltwater Fishing Marketing Company Ltd. which sets minimum prices for the sale of their goods.

Minimum market prices

The minimum prices differ according to the value of the various types of fish. Under an agreement among the Federal Cartel Office, the Federal Ministry of Food, Agriculture and Forestry, the Federal Ministry of Economics and Saltwater Fish Marketing Company Ltd., they are not to exceed 80 per cent of production costs of the total catch. Fish that is not sold at these prices must be delivered to fishmeal factories, unless it is intended for export. As a result, daily surpluses are avoided and the market is clear after an auction.

In addition to high-sea and lugger fisheries, cutters are supplying the market with increasing quantities. They land fish caught along the coast and offer it for auction, also with lower price limits.

Cutter fishermen have founded a cooperative which includes most of them. Apart from helping with new equipment, the main task of the cooperative is to market and process catches which are not sold at minimum prices on auction because of different market situations.

Producers receive their proceeds through the market company (Fishing Port Management Company Ltd. of Bremerhaven) usually ten days after an auction, less costs of unloading and auction.

Market procedures are subject to special conditions governing use and business.

In addition to this economic activity, the market company gives direct or indirect support to measures taken by fisheries interests to promote the marketing of fish. This includes financial aid for the establishment of processing plants, cold storage and similar installations, as well as assistance for mechanization and rationalization in all sectors of fisheries.

La Administración del Puerto Pesquero en Régimen de Empresa

por V. Paz-Andrade

The administration of fishing ports by private enterprise

In this paper the author indicates the functions of a fishing port in relation to the fishing fleets and marketing, outlining his view on the role played by the government in planning, as well as constructing and maintaining such ports. His views on the advantages that could be expected from private organization and administration of ports, over which the government should keep some specific control are also described.

L'administration des ports de pêche par des entreprises privees

Dans ce document, l'auteur décrit le rôle du port de pêche et ses rapports avec les flottes de pêche et les structures de la commercialisation, et fait ressortir l'importance de l'intervention du gouvernement dans la planification, la construction et l'entretien des ports de pêche. L'auteur exprime également ses opinions quant aux avantages que l'on pourrait s'attendre de l'attribution à des entreprises privées de l'organisation et de l'administration des ports de pêche, qui seraient cependant soumises à certaines formes de contrôle gouvernemental, spécifiquement établies.

EL puerto de pesca responde a una concepción específica. Tanto se distingue de otro tipo de obras públicas, como de otra clase de puertos. Las funciones del puerto de pesca, por un lado se orientan al servicio de la flota. Por otro, a servir como plataforma de lanzamiento de los productos sobre el mercado.

La dualidad de fines no solo determina variantes de estructura, con relación al puerto comercial ordinario. Tambien debe determinar cambios en el régimen de explotación, tanto para asegurar el empleo mas rentable del equipo de capital, como para maximizar el beneficio a obtener por los productores.

Así el primer objetivo económico como el segundo, resultan interferidos por la organización del puerto. La posibilidad de que sean alcanzados, no depende exclusivamente de la conducta de los usuarios. Depende basicamente de que el puerto desarrolle su acción con la eficacia, la agilidad y la coordinación necesarias para la mayor productividad del esfuerzo pesquero.

Es obvio que ésta finalidad pertenece al interés privado. De donde se deduce, sin más, que la misión de alcanzarla no debe hallarse a cargo del sector público. El principio de especialización, tan caro a los economístas clásicos, obliga a separar la responsabilidad de la construcción de los puertos pesqueros, del régimen de su administración. Con la construcción y habilitación del puerto debe terminar la misión activa del Estado, en relación a los puertos de pesca. Después entra la responsabilidad del sector privado, efectuando en régimen de expresa comercial la prestación de los servicios a la flota y al producto que aporta.

CONCEPCION DINAMICA DEL PUERTO DE PESCA

Dentro del proceso de producción de alimentos marinos, el puerto pesquero constituye un órgano clave. Algo así como el corazón del sistema, que comienza en el caladero y termina en la mesa del consumidor. Con los dos movimientos típicos, uno de sístole industrial y otro de diástole comercial. El primero, orientado hacia la fuente de los recursos vivos, y el segundo al mercado.

Esta premisa conduce a otra. El puerto pesquero no es una estructura asimilable funcionalmente a la de otros puertos destinados al tráfico de mercancias inertes, como los cereales, los minerales, los productos manufacturados, las primeras materias durables, etc. Para éstos puede bastar una concepción estática, cuajada en el molde tradicional, que se limite a facilitar línea de atraque para los buques, dispositivos de carga y descarga, almacenamiento, conexión con los medios de transporte, fuentes de suministros prin cipales para la navegación, etc.

El puerto de pesca moderno necesita todo lo que se indica, y mucho mas. Responde a una concepción dinámica con doble proyección, al servicio de una mercancia en gran parte de consumo inmediato, sujeta por naturaleza a escasa durabilidad. Precisamente, por esta condición somática del producto, riesgo implícito de descomposición, el tratamiento del mismo a través de la organización del puerto de descarga, habrá de ser específico. Los fines a cumplir en éste caso son distintos, a los que ordinariamente cumple un puerto concebido para tráfico no específico.

Función del puerto en relación a la flota

La idea del puerto de pesca, presupone un volumen de tráfico, que justifique tanto la especialización como la inversión. Por su infraestructura, lo mismo que por su localización, las opcion se del usuario deben resolverse a favor de la mayor suma de "economías externas". Donde con mas seguridad puedan obtenerse, se producirán las mayores concentraciones de flota.

Para que ésta "primum mobile" se haga fecundo y duradero, a la localización y a la infraestructura ha de sumarse la organización de servicios y suministros. Aunque la provisión de unos y otros se haga por los propios usuarios, o por firmas especializadas, concesionarias o de libre acceso, la prestación sincronizada y coordinada, especialmente en puertos con aglomeración de tráfico, necesita una dirección idónea en permanente actividad.

Tanto en la preparación de las expediciones, como en la recepción de sus frutos, la eficiencia de los servicios portuarios se pone a prueba. Si no se hallan a punto, o si se desenvuelven a ritmo retardado en relación al de la necesidad, o fallan en la conexión con los canales de distribución... la productividad económica de los equipos de captura puede verse sin necesidad disminuida. Algo equivalente sucederá con la descarga y manipulación del pescado. Desde los horarios de trabajo a la prestación del mismo la provisión de cajas de transporte, la utilización de grúas y cintas transportadoras, acarreo mecánico de la mercancia, lavado, reclasificación, embalaje, facturación, almacenamiento, etc., se desarrolla una serie de operaciones, ligadas al rendimiento del negocio pesquero. De la agilidad y reajuste con que se ejecuten, depende en parte el ingreso de la empresa productora.

Cuando el puerto carece de una organización centralizada que unifique los servicios y suministros, los costos de su prestación se incrementan. Este encarecimiento llegará al máximo donde cada empresario pesquero tenga que hacer frente individualmente a todos aquellos que no preste la administración del puerto o el ente jurídico creado con tal finalidad concreta.

Función del puerto en relación al mercado

La segunda vertiente funcional del puerto pesquero, es la que mira al mercado. La primera transacción de la pesca desembarcada se verifica generalmente en el puerto de recepción. Bien mediante subasta entre pescaderos, exportadores, mayoristas, etc., bien en otra forma.

La congelación a bordo ha introducido una diferenciación en este tráfico. Antes se hallaba uniformemente sometido al riesgo de la deteriorización rápida, que caracteriza a los productos **in natura** de origen marino. La estabilización de la calidad y la frescura que se logra con la congelación, sólo preserva una parte de la oferta global. La otra parte, que es la mayoritaria, ha de ser vendida al por mayor bajo el apremio de aquél riesgo.

Tal circunstancia obliga a ejercer la defensa comercial, de los productos que se destinan en fresco al abasteci miento de la población. La defensa requiere una estrategia del mercado, que ha de ser desarrollada día a día, combinada con la oferta de los demás puertos del país concurrentes a los mismos centros o zonas principales del consumo.

De este modo, la fase de circulación y distribución de la oferta, resultará mejor ajustada a la demanda real, evitando las caidas de precios consecutivas a la congestión y la poca elasticidad. Al mismo tiempo, el consumo efectivo del pescado, en la mayoría de los países, dista mucho del nivel potencial. Una política constante de promoción de ventas, resulta necesaria, para que la media **per capita** sea elevada donde aun resulta extremadamente baja.

Pero ésta acción sobre el mercado debe arrancar del puerto. Presupone constante control de calidad y coordinación de la oferta. O sea, un conjunto de mecanismos de índole comercial, que sólo pueden funcionar eficazmente bajo el pulso de la empresa privada.

LA MISION DEL SECTOR PUBLICO Y SU LIMITE

El Estado construye los puertos de pesca, como construye los demás puertos. Y, al terminar su ejecución, la única misión que a su cargo queda, es la de conservación, mejora o ampliación. Todo dentro de la esfera genuina del sector público.

En algunos países de gran importancia pesquera, las cosas aun suceden de éste modo. Al organismo estatal, encargado de la construcción mejora o conservación de las obras del puerto, tambien se confía la prestación y administración de los servicios, tanto generales como específicos del tráfico pesquero. La concepción dinámica del puerto, queda de éste modo sustituida por la del puerto burocratizado. El espíritu comercial que sólo podría infundirse en un régimen de gerencia privada, queda neutralizado por el formalismo y la rigidez oficiales.

El gobierno de los puertos pesqueros por empleados del Estado, constituye una prolongación de funciones, lesiva para el interés de los usuarios. El puerto, así regido, no puede desarrollar la acción comercial, que los productos alimenticios de la mar reclaman, desde que ingresan en tierra. O sea, desde que entran en un proceso productivo a cargo de la actividad privada.

Por tanto, los límites del sector público, en relación con los puertos pesqueros, deben quedar vinculados a la responsabilidad de su construcción, conservación, ampliación, reforma, etc. El tráfico pertenece a otra esfera de actividad, de especialización y de interés económico. Pertenece al sector privado.

REGIMEN DE CONCESION ONEROSA

Dentro de la concepción dinámica del puerto de pesca, el interés del Estado y el de los usuarios son perfectamente conciliables. Incluso con notorio provecho recíproco, sin que la Administración invada la órbita de la Industria, ni pueda producirse el fenómeno inverso. La fórmula para armonizar ambas economías, la del sector público y la del privado, es ya conocida. Incluso ha sido ya ensayada en determinados puertos europeos.

La justificación que puede invocarse para retener la explotación del puerto, en manos del Estado, después de ultimada la construcción no puede ser otra que la necesidad de hacer efectivo el reembolso a largo término de la inversión. La misma razón podría invocarse con referencia a la financiación de nuevas dársenas, muelles o instalaciones, etc., que el crecimiento del tráfico haga necesarias.

A una seguridad tan legítima, no debe sacrificarse la eficiencia del puerto, tanto en su aplicación de base industrial, como en la de cabecera comercial. El régimen de concesión administrativa, dentro del marco consagrado por el derecho, ofrece solución al caso. Se reduce a establecer, con base en el volumen de las inversiones realizadas y previsión de las que a plazo corto puedan realizarse, el importe del cánon o el porcentaje de participación en los beneficios de la explotación, que deba satisfacer periodicamente la Entidad concesionaria al Estado concedente.

Tambien resulta viable, la conservación por parte de la Administración Pública, de determinadas facultades, tanto de control sobre las tarifas a aplicar, como de fiscalización sobre los servicios. A ésto quedaría reducida la copiosa plantilla de personal administrativo, que en los puertos aun explotados directamente por el Estado se halla adscripta a servicios relacionados con el tráfico comercial, sin encuadramiento profesional idóneo.

COMPOSICION DEL ENTE CONCESIONARIO

Tambien se hall a resuelto, el problema de la composición de la Entidad privada, a la que debe confiarse la explotación del puerto pesquero. Es obvio que son los usuarios del puerto, y no elementos ajenos al sector pesquero, los que deben aporter el capital de constitución, y participar en el cuerpo de su administración. De éste modo, la responsabilidad de la gestión diaria, llamada a conducir la red de servicios del puerto, tendida hacia la flota y hacia el mercado, será asumida por los propios interesados, a través del Ente que a base de su asociación se constituya.

Podría adoptarse como marco jurídico la forma de sociedad anónima, con acciones nominativas, cuya transmisión se vinculara a la condición profesional del titular. Tambien podría optarse por la forma de cooperativa de servicios. En uno y otro caso, debería ofrecerse a todos los usuarios legalmente matriculados en el puerto, la participación en el capital de la sociedad concesionaria, en proporción al volumen de inversión que el negocio de cada firma represente, el volumen habitual de las operaciones que realice y otra norma que equilibre en lo posible el interés real con el representado en la Entidad a formar.

Asimismo debería regularse el acceso a la misma, de los empresarios que en lo futuro fuesen incorporándose al sector. Mediante ampliaciones de capital, o reserva de acciones en cartera donde la legislación lo permita, o mediante otro mecanismo jurídico, la composición del Ente gestor del puerto debería mantenerse abierta a la accesión de nuevos industriales del ramo de las pesquerías, tanto dedicados a la fase primaria como al proceso comercial de los productos.

La concesión se otorgaría por un número determinado de años, nunca inferior al que permita efectuar la amortización de las inversiones que la Sociedad realice. La renovación periódica de la licencia administrativa podría utilizarse para reajustar la composición del Ente concesionario en todo caso. Especialmente cuando las garantías previstas para el acceso sucesivo de nuevos usuarios no hayan funcionado a plena satisfacción.

VENTAJAS A ESPERAR DE LA REFORMA

No entra en los propósitos del autor de este trabajo, realizar un estudio exhaustivo del tema. Ni tampoco llevar mucho mas allá la descripción de la estructura a establecer, para descargar a la Administración Pública, de una función cuya naturaleza predetermina su carácter privado.

Debemos, no obstante, añadir, que la proposición sería susceptible de ambiciosos desarrollos, engranados positivamente en la economía general del país. La organización de los puertos, en régimen de empresa comercial, permitiría renovar y modernizar el sistema de comercialización y distribución de los productos alimenticios de origen acuático, con beneficio para todo el país:

Financiamiento mutuo

Dado el alto volumen de tráfico que en los puertos pesqueros de verdadera importancia se concentra, solamente la unificación de las ventas al mayoreo en mano de los propios productores, permitiría una acumulación de disponibilidades, suficientes para alimentar a través de una sección bancaria, la **financiación a crédito del sector.** De fuente propia, aunque colectiva, el empresario pesquero dispondría de una **masa de capital de préstamo,** tanto fijo como circulante. De éste modo, el Estado, aun manteniendo una intervención permanente en el órgano gestor, podría quedar relevado de la carga que supone el crédito institucional para la construcción de flota, la reconversión de instalaciones, ampliación de la red frigorífica, etc. Y la industria resultaría mejor atendida.

Precios mínimos garantidos

El perfeccionamiento del sistema podría proporcionar una reducción del riesgo para el empresario, en cuanto proviene de la incertidumbre que actualmente gravita sobre el precio de la oferta en fresco, y a veces sobre la de pescado congelado. La Sociedad gestora, con independencia de la normalización resultante de la mayor coordinación entre los puertos principales, tendría medios para **asegurar a un precio mínimo a los oferentes del producto,** acreditándose en cuenta posteriormente las diferencias.

Coordinación del abastecimiento

La coordinación de la oferta, mediante la interelación de las Entidades gestoras de los principales puertos del país, permitiría tambien sincronizar **mejor el abastecimiento de los mercados,** evitar las aglomeraciones que eventualmente desvalorizan el producto, reducir el margen de la especulación, etc. Al propio tiempo, facilitaría la coordinación en calidades, atendiendo las preferencias del consumidor en determinadas áreas. Y en todo caso, por el mismo medio cabría prevenir o corregir los desequilibrios del mercado, especialmente los ocasionados por la fricción autocompetitiva.

Incremento de la demanda

Finalmente, la mayor dotación de medios y la acumulación de experiencia comercial directa, en las sociedades gestoras de los puertos pesqueros, haría posible acometer a fondo la remoción de los obstáculos qué, en la mayoría de los paises, europeos y americanos, se oponen aun el logro de un **nivel mas alto de consumo por habitante.** El perfeccionamiento de los canales de distribución, los transportes, la presentación y dosificación de los productos, el mayor avance en las técnicas de comercialización... determinaría en pocos años un incremento copioso de la demanda. O sea, cubriría unos objetivos, de antiguo ambicionados, pero que no se alcanzan por los sistemas tradicionales, faltos de idoneidad económica, de unidad y de adecuación.

Sea-fish Market at Cuxhaven and its Economic Importance

by M. Hauke

Le marché des poissons de mer de Cuxhaven et son importance économique

Cette communication a trait à l'organisation de l'important marché allemand des poissons de mer à Cuxhaven. Elle décrit dans leurs grandes lignes les relations entre le Gouvernement de la Basse Saxe et l'organisme de gestion de ce marché, la Compagnie du marché des poissons de mer de Cuxhaven. Elle traite également de l'importance de ce marché dans l'économie et de ses installations.

El mercado de pescado marino de Cuxhaven y su importancia economica

Describe este estudio la organización del importante mercado de pescado marino de Cuxhaven. Expone la relación existente entre el Gobierno de la Baja Sajonia y la empresa que administra el mercado, La Compañía del Mercado de Pescado Marino de Cuxhaven, Sociedad Lda. Describe igualmente la importancia relativa del mercado y de sus instalaciones y servicios.

CUXHAVEN sea-fish market, excluding its water area, covers about 51 hectares (127 acres) and, with its buildings, services the fishery industry. All firms engaged in high-sea fishing and in the fish-processing industry, as well as many ancillary services, have established their operations in this self-contained economic area. Cuxhaven fish market enjoys a special advantage as a two-chamber sea lock makes its new harbour independent of tides, and this greatly simplifies and facilitates unloading of trawlers.

The whole area of the fish market is owned by the Land of Lower Saxony. With the shore installations and production plants built by the Land, the area is managed by the Cuxhaven Sea Fish Market Company Ltd., which also runs the fish market proper, that is, the auctions. Part of the area has been leased to firms engaged in high-sea fishing, the fish-processing industry, fishmeal and ice factories and other fishery operators, for the construction of their own buildings. Other buildings put up by the Land of Lower Saxony have been leased through the Cuxhaven Sea Fish Market Company Ltd., to fish wholesalers, fish-processing firms, producers of smoked fish and delicacies, and to a cold-storage company.

The value of these buildings, including machinery, roads and squares, rail tracks and cranes, but excluding embankments, the lock, and other protective works along the shore, totals about DM 100 million ($25 million).

Under an agreement with the Land of Lower Saxony whereby the Cuxhaven Sea Fish Market Company Ltd., has the right to use the Land's property; the Company is obliged to maintain and renew the installations. To this end, it must pay an annual amount into a so-called "reserve fund for renewal commitments toward the Land of Lower Saxony". The amount is calculated on the basis of the costs of replacement and restoration for the business year concerned, taking into account the probable durability of the installations.

About DM 1.65 million ($412.500) were paid into this "reserve for renewal" in the 1967 business year.

The Cuxhaven fishing fleet totals 31,775 gross tons, with a loading capacity of 236,000 crates. The volume of production of sea-frozen fish may be put at about 20 per cent of the German fishing fleet.

About 60 fish-processing firms of different size also have their domicile in the harbour area of Cuxhaven fish market. They are mainly wholesalers, canneries, plants for marinades, delicacies, sea salmon and deep-freezing, as well as producers of smoked and salted fish.

Altogether 8,000 people are employed in the area of Cuxhaven fishing port.

The turnover of fish landed in Cuxhaven in 1967, including fish products such as deep-frozen fillet, cured fish, fishmeal, fish oil and liver oil, totalled about 166,100 tons valued at about DM 105.3 million ($26.3 million). Of this, about 113,000 tons valued at about DM 77.7 million ($19.4 million) were sold by auction by the Cuxhaven Sea Fish Market Company Ltd., on behalf of the suppliers.

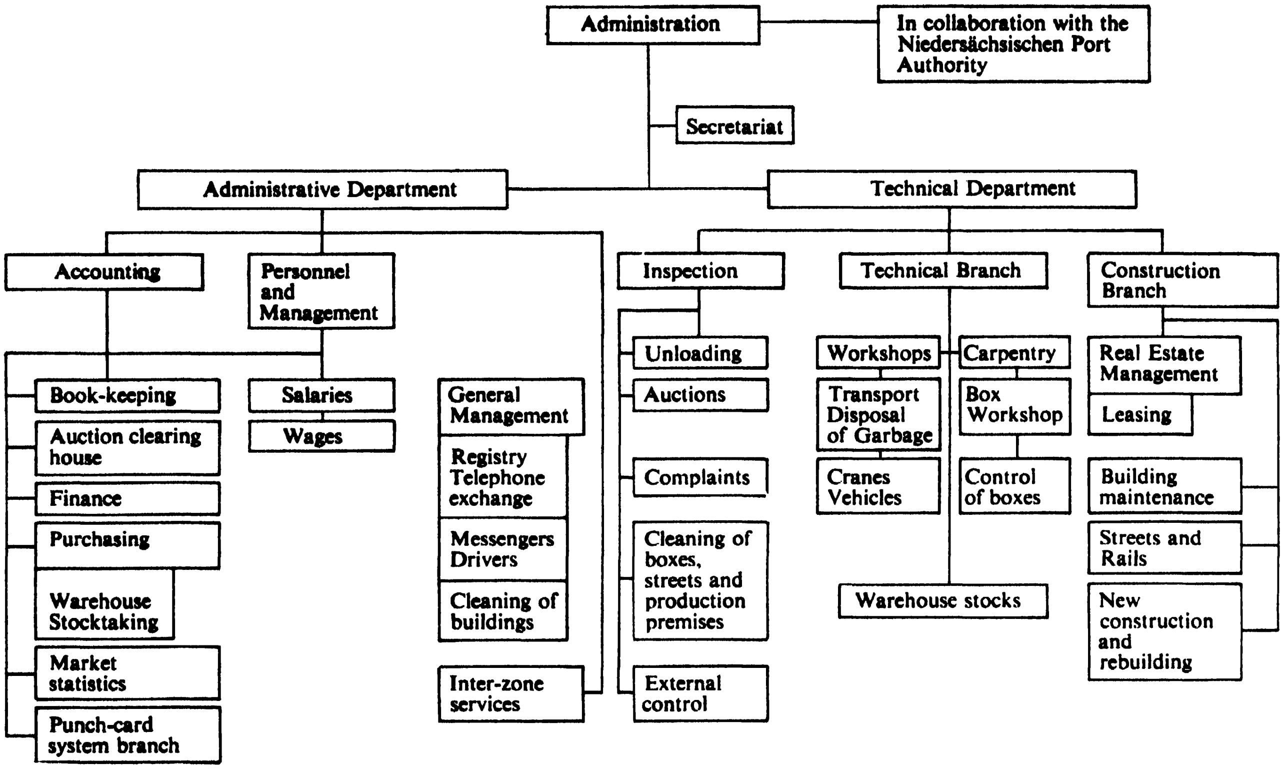
In 1967, as in past years, more than 80 per cent of all fish landings in the Federal Republic was traded in the two big sea fish markets of Bremerhaven and Cuxhaven in almost equal shares.

TABLE 1. RELATIVE LANDINGS AT THE FOUR PORTS

	Quantity tons	*Percentage*
Cuxhaven	113,013	39.84
Bremerhaven	114,628	40.41
Hamburg	24,219	8.54
Kiel	31,808	11.21
	283,668	100.00

All trawlers and luggers engaged in the deep-sea fisheries and the great herring fisheries land their cargoes at the unloading wharf in the new fishing harbour, equipped with three auction halls (IX-XI). Hall IX has cold-storage facilities above the auction room, with a capacity of about 6,000 tons at −30°C (−22°F), and of about 1,200 tons at 0°C (32°F). The total length of the auction halls is 641

ADMINISTRATIVE ORGANIZATION OF THE PORT OF CUXHAVEN



metres (705 yards) and 30,000 boxes with 1,500 tons of salt-water fish can be placed side by side.

The cutters of near-water fisheries and inshore fisheries unload their catch in the old fishing harbour at auction halls III to VI, while crab cutters use the unloading wharf in front of halls I and II north of the sea lock.

The leading position of Cuxhaven fish market, with its specialized fishing harbour, is due to various factors. It has a favourable location because it is closest to the fishing grounds. In addition, it is situated in an area well suited to harbour development, with ample space for an expansion of its activities in a south-easterly direction.

With its quick and smooth operations, the port will keep pace with economic developments in the future as well, and in particular, will consider the measures required for German fisheries by structural changes in fisheries, long-distance fishing, and the full liberalization of fish imports from the EEC and EFTA areas.

DISCUSSION

ADMINISTRATION AND MANAGEMENT OF PORT MARKETS

Pérez Bellod (Spain—Chairman) observed that this subject complemented that of the previous session—namely what could be called the operation of the fishing port.

Beattie (UK) suggested five possible points for discussion:

(a) What authority should own the fish market? Should it be representative of the users; should it be the port authority or should it be a completely independent body responsible only to the port authority?

(b) Should the floor of the market be at ground level or at lorry-platform level?

(c) Should fish markets be open to the public?

(d) The reluctance of fish market users to accept changes as modernization.

(e) A new fish market was much easier to build than the conversion or modernization of an old one.

Gifford (UK) remarked that where there was a pursuit of tourism there should be public access to the market. Although this must not be at floor level because of hygiene and safety, a gallery could often be provided at little additional cost which could be a source of revenue. Although one should not generalize in these problems, there was often a good case for the provision of loading docks in the market not only because of the assistance they gave to loading, but because of the limitation on road vehicle access which the market automatically imposed.

Open markets—bad publicity

Hauke (Federal Republic of Germany) felt that the question of prohibiting fish markets to the general public was not only a matter of hygiene. Visitors to fish markets might sometimes get the impression that the best possible treatment of the fish was not being given, for instance transport to factories from auction, fish lying about everywhere, filleting, all that kind of work might not make the visitor very keen on fish consumption afterwards. Therefore, he believed that visits to a fish market were not necessarily good publicity. With regard to possible innovations these would always be heavily criticized by users if they had to pay higher dues. The user expected that all services and everything connected therewith should be completely free. Moreover, he expected much more to be done for him, and to prove this, he would always point to a neighbouring port, which would be Bremerhaven, in this case. He wanted to emphasize that users of a port, who were, at least in Germany, sometimes associated with each other, were not always the ideal partners for a discussion on renewals and improvements. The possibilities of any market authority going ahead with renewals sometimes proved rather limited. At times it could only be done through a special legal provision; and really efficient administration and management of port markets required substantial financial resources.

Favazza (USA) said he must agree with his German friend regarding the inadvisability of allowing the public free access to fish markets. In Gloucester they had on the State Fish Pier a reduction plant as well as fish processing plants. It had been necessary to post a large sign "This fish is not for human consumption" over the reduction plant's holding room. Many tourists might have been deterred by the odour from the reduction plant and have left thinking the odour was from the fish to be marketed for human consumption.

Also there was recently a T.V. programme showing the unloading and filleting of fish in the worst light possible and the commentary stressed this was not the way food fish should be handled. Then the film showed a plant processing fish blocks into sticks. Of course, this was a relatively clean operation. The commentary stressed this aspect, stating that this was the way food fish should be handled.

The fact of the matter was that the film was comparing two separate phases. The fish that was being unloaded and filleted might well have been the fish in the second part of the film.

He emphasized this to indicate how easily the public could be misled to the detriment of the fishing industry.

Quality control necessary

Meiners (Federal Republic of Germany) commented on quality control and inspection. As far as the European countries were concerned there were various procedures. There were State veterinarian inspectors who were specially trained in judging the quality of the landed fish. He emphasized that because of the economic aspects of the perishability and spoilage of fish, independent governmental state inspection services should carry out the inspection and their judgment should be final .Quality control should be completely independent and impartial because buyers and sellers usually had different ideas about the freshness of fish. Regarding free access to marketing establishments and sea-fish markets for visitors he was convinced this was not very good publicity. In slaughter houses people were only allowed to enter if legitimately connected with the trade. As the participants would know, both Bremerhaven and Cuxhaven were public places were anybody could wander in and out. In transporting fish from the holds to markets, it was necessary, for hygiene reasons, to cover the fish in some way. In Germany they were now working towards establishing hygienic provisions concerning transport of fish. This was a field where there still was a lot to do.

O'Mealláin (Ireland) said that what fish market visitors wanted to see was generally the auction hall, as auction procedure could be very interesting. There seemed to be no reason why visitors should not do so. Clearly they should not clutter up the auction area or get in the way of fish trucks and the like, and he suggested a mezzanine floor or observation bridges across the hall. On minimum price systems he said that the problem of gluts of low price fish was widespread. He thought it ought to be possible to introduce a minimum price scheme backed up by a price support fund, financed by a levy on all fish landed at the port, and used to pay to the fishermen something to bring the price up to or over the minimum price. Was something on these lines being done in the Netherlands?

Riem Vis (Netherlands) said that they had found no solution to the problem of minimum prices in the Netherlands.

Minimum price system in UK

Cox (UK) gave some information about minimum price systems in Great Britain, and pointed out that they had a minimum price schedule at Hull and also a Fish Prices Equilization Scheme in support of the minimum price. If fish at the auction fell below the fixed minimum and went for purposes other than human consumption, then the producer received a payment out of the scheme. This was in a sense a two-platform minimum price structure. All owners contributed to the Fund on all fish landed from their vessels. This Scheme had nothing to do with supporting fishermen's earnings, and was an owners' support scheme. The fishermen were supported in their wage structure as they were paid a basic wage plus a bonus. As they were guaranteed "average earnings" based on annual earnings, they were not the losers if a catch did not reach the fixed minimum prices.

Cormack (Canada) spoke about the promotion of fish consumption and said that as rationalization was a partial solution towards curing the trouble which affected the industry, it might be worth considering a combined effort by the industry at local or regional level to promote fish consumption through various advertising media. This did not mean that individual firms should lose their identity. If they wished, they might supplement a co-operative arrangement with their own private advertising programme, but a concentrated effort on a particular type of product could have more influence on the public than the present disjointed form of advertising. This method of a combined advertising effort on a national scale had been used by the fruit and dairy business with success. An investigation of the savings in advertising costs by the foregoing industries might be worth considering.

Problem of general publicity

Hauke (Federal Republic of Germany) remarked that in Cuxhaven and in Bremerhaven and in other ports they had a joint campaign to increase the consumption of fresh fish. The producers of frozen fish up to now had said that this was completely against their interests. They sold on the market as well and why should publicity be made for only one branch of the fishing industry? Moreover, small undertakings knew their customers and could take care of them. Often they were not interested in spending money on publicity and here the administration and management of port markets came into the picture. In Cuxhaven, the management of the port was run by a supervisory board with representatives of the Ministry of Finance and the Ministry of Agriculture, the town, and the workers. They had meetings where investment plans and projects were studied as well as future market policies. It should be noted in this connection that the representative of the Ministry of Agriculture often was of a different opinion to the representative of the Ministry of Finance. He was interested to learn how the general management of other fish markets functioned but he was in favour of an organizational set up similar to the one in the Federal Republic which operated fairly smoothly.

Useful direct methods

Fulham (USA) observed, with reference to Cormack's remarks on advertising specific products and Canadian lobsters being sold in Montreal as "Maine" lobsters, that they were much more disturbed by the sale of Canadian lobsters in Boston and New York as "Maine" lobsters. They had in the USA a scheme, covered by a Federal Law for aid to fisheries called PL 88-309 (Commercial Fisheries Research and Development Act) which combined funds two-thirds from the

Federal and one-third from the local State. Advertising and promotion of local fish species were allowed under this law. In Massachusetts they had used this law for promoting haddock and the State of Florida had also invoked it for the sale of red snapper. The results of promoting a specific species in a specific market for a short period had given sales increases during that period of up to 300 per cent.

Adam (OECD) reverting to price systems, remarked that a very great variety of price systems existed; it was quite impossible to give even a small idea of the many solutions which had been adopted. He referred participants, to the Price Systems Study published by OECD in 1966. These systems and their possible modifications might be important to consider for port planning as they might vastly influence the handling of fish.

Bourgois (FAO) said that when a large amount of fish was brought to the market, the auction process was sometimes so long in tropical countries that some fish lost its freshness. Were fish markets organized to prevent this?

Marchal (France) said that France at present was building a fishing port in Ceylon where fresh fish as soon as landed would be placed in a refrigerated room with a range between +10°C and −15°C (as required) before being sold.

Value of statistics

Hildebrandt (Netherlands) said, on fishery statistics, that the auction data ought not to be only a basis for their financial transactions but also a tool of management. For market and operations research, statistics of landings per day, per trip, per species of fish and so forth were needed, but fishery statistics in many countries were very old-fashioned. Even if at all feasible, it was very expensive and required a lot of time to get the figures one wanted. A reorganization of fishery statistics was necessary. In Holland they had done this. The account of the auction for the fishermen or company owner was also the basis for fishery statistics. To this end a computer was used. In this way if was possible to obtain all items desired in a very short time.

Cox (UK) said he agreed with Hildebrandt on keeping statistics. They were needed for all problems under consideration, and he would advise the keeping of statistics by all ports whether small or large. Hull had a Department of Economic Investigation and statistics were kept covering all fields, and the various Associations connected with the British Trawlers' Federation were entitled to use them.

Goldet (France) reverting to the administration of auction halls, said that in all large French ports they had a sort of consultative board, usually made up of representatives of the Chambers of Commerce. Members were recruited rather differently than in Germany, because they were representatives elected to protect the interests of the local trade, including both buyers and sellers, and the representatives of the administration were fewer in number. The work of these boards was sometimes made difficult because of the conflicting interests represented through the various member groups of buyers and sellers. Continuous arbitration was therefore needed, in particular in the large auction halls. However, arbitration was often a very complex and time consuming process.

Marketing halls

Vazquez (Argentina) said that in Argentina, at present, they did not have halls for fish marketing, and he would like to have some information about this from the participants, in particular on hygiene.

Beattie (UK) said the main advantage of a fish market at floor level was that it was accessible to wheeled vehicles, although such vehicles should be confined to specified areas. The main disadvantage was that fish in boxes had to be lifted by mechanical means to lorry platform level.

Meiners (Federal Republic of Germany) said it was rightly claimed that it was not convenient for hygienic reasons as well as for reasonable viewing to have people walking on boxes as participants had seen in Bremerhaven auction, and he thought hygienic regulations were needed. Regulations should provide for walking spaces between rows of boxes where buyers could walk. If one used plastic boxes on wooden platforms and transported them in and out of the auction either on fork-lifts or on pallets then it would be necessary to have a completely level floor. In markets in hot climates, one wanted to avoid fish remaining outside too long thereby losing its freshness. Bremen, during the summer had this problem time and again. In all German ports the halls were washed very frequently during summer. This created a cool atmosphere; furthermore, a layer of crushed ice was spread over the boxes.

They also applied another method which was pre-sale of fish. Some firms, who wanted their fish supplied at 7 o'clock in the morning, could take the fish away before it was auctioned or immediately after being landed. They would then pay later the price which had been obtained during the auction. This method should be considered in areas with a hot climate to prevent loss in freshness and quality.

Lafouge (France) said that in Boulogne the sale was effected in a hall separate from where the fish was displayed—in the landing hall. There lots were identified and inspected before auction. Furthermore, in the auction hall itself, the prices of the seller were put up on a board. The sale was effected in this closed-off hall with everybody sitting down, and nobody could move or walk on the boxes.

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